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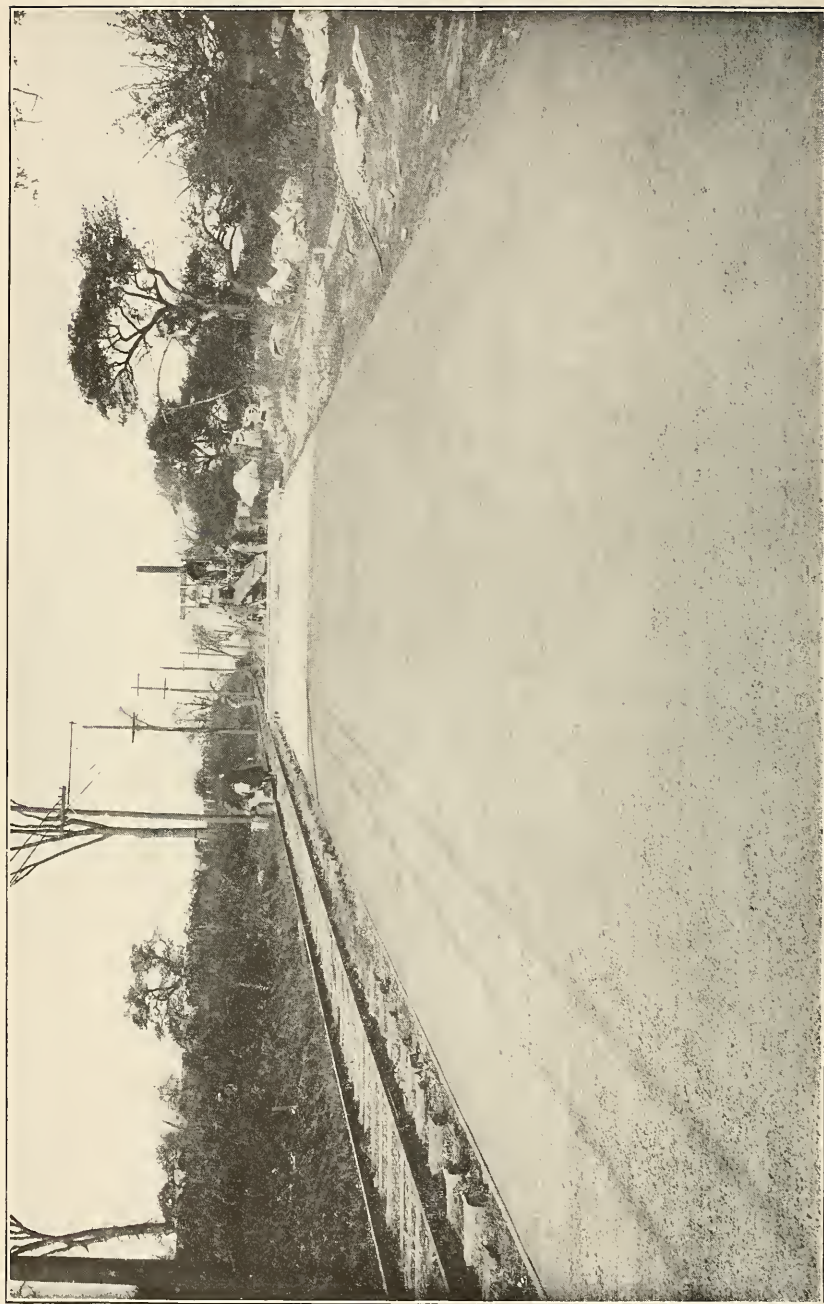
MASSACHUSETTS
HIGHWAY COMMISSION

YEAR ENDING NOVEMBER 30

1913



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Cement Concrete Road under Construction in North Andover.

TWENTY-FIRST ANNUAL REPORT

OF THE

MASSACHUSETTS

HIGHWAY COMMISSION,

FOR THE FISCAL YEAR ENDING NOVEMBER 30, 1913.

JANUARY, 1914.



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APPROVED BY
THE STATE BOARD OF PUBLICATION.

The Commonwealth of Massachusetts.

To the Honorable Senate and House of Representatives of the Commonwealth of Massachusetts in General Court assembled.

The undersigned commissioners, appointed under the provisions of chapter 476 of the Acts of 1893 and of chapter 474 of the Acts of 1900, herewith submit their twenty-first annual report, in accordance with the provisions of chapter 47 of the Revised Laws, for the fiscal year ending Nov. 30, 1913.

WM. D. SOHIER.

F. D. KEMP.

JAMES W. SYNAN.

BOSTON, MASS., Jan. 6, 1914.

ANNUAL REPORT OF THE MASSACHUSETTS HIGHWAY COMMISSION.

The Board consists of the same members as last year. Mr. William D. Sohier was reappointed by Governor Foss on Feb. 26, 1913, and has continued as chairman.

ORGANIZATION.

The commission has under its charge road work, the registration of motor vehicles and the licensing of the operators thereof, as well as the investigation of accidents. There is a department for the highway work and another for motor vehicles, with a separate division for the investigation of accidents and the examination of operators. A chart is printed in the Appendix to this report, showing the organization more in detail.

TELEPHONES.

When the Public Service Commission was established by chapter 784 of the Acts of 1913, the duties imposed upon the Highway Commission were transferred to that Board, which was authorized to take up and continue any investigation into rates and service or methods of accounting that had been undertaken. The telephone and telegraph companies were required to make returns to that Board rather than to the Highway Commission, and, consequently, the returns which have heretofore appeared in the reports of the Highway Commission will hereafter become a part of the reports of the Public Service Commission.

Final Report on Telephone Rates.

The act creating the Public Service Commission took effect on July 1, when provision was made for the appointment of the two new members. This commission, therefore, requested its experts, Messrs. D. C. and Wm. B. Jackson, who had been

engaged in investigating the rates and charges of the telephone company, as well as making traffic studies, to make a final report to it, summarizing the work that had been done, and the recommendations that had been made in the last five years that that firm had been employed. The commission also requested that summaries be given showing how the new rates recommended by the commission had actually worked in practice. This report will be found in Appendix M.

Summary of Telephone Investigations and Recommendations.

In the year 1907 the commission received a very large number of protests against existing telephone rates and charges, of discrimination and inequality of the rates, and complaints of the service, particularly on the multi-party lines. As a result of these complaints many largely attended hearings were held, and it was decided that a thorough investigation and an inventory of the property of the company should be made.

The Commission employed Experts to make this Investigation.

Pending the making of the inventory, the commission recommended that the toll charges in and out of Boston to sixteen adjacent central exchanges, that were within 5 miles, should be reduced from 10 cents to 5 cents. This change was made by the company.

Inventory of the Property of the Company recommended.

On the recommendation of the commission, the Legislature, in 1908, made \$30,000 available for the purpose of making an inventory of the property of the company, and the inventory was made during the next year.

Actual Property greater than Capital.

The inventory showed that the replacement value of the property of the company was largely in excess of the capital and debts outstanding. This inventory included not only the property in this State, but the property in the adjacent States covered by the New England Telephone and Telegraph Company.

The commission reported the result of the inventory and recommended that a further study be made of the rates, service, traffic, accounting, etc. The Legislature, in 1909, made available \$35,000, and authorized the commission to have a complete study made of the system of accounting, the rates of the company, traffic, etc.

In 1913 the Legislature made available \$7,500 more to be used in continuation of the various studies of rates, traffic, etc. This made a total of \$72,500 which had been made over for the use of the commission for these various purposes. The expenditures have amounted to \$65,702.50, leaving a balance, \$6,797.50.

Comprehensive Study of Accounting, Rates, Charges, Traffic, etc.

The study of the accounting system was made by Mr. Patterson of the firm of Stone & Webster, working in co-operation with D. C. and Wm. B. Jackson, who had been employed to make the inventory and also a study of the rates, service, traffic, etc.

A very comprehensive study was made of the rates, charges, traffic, etc., in and around Boston and the suburban district.

A report was made to the commission by the engineers in February, 1910. This report recommended various changes in rates, the establishment of new rates, the establishment of zones, etc., in the metropolitan and suburban district. A number of hearings were held upon these recommendations, and the commission, finally, in August, recommended a new schedule of rates to be adopted by the company, covering the metropolitan and suburban district.

The commission, in the meanwhile, also made various suggestions recommended by its experts, in relation to the system of accounting, which were adopted by the company.

New Schedule of Rates recommended.

The new schedule of rates recommended was accepted by the company and put into effect gradually during the latter part of 1910 and in 1911. The new rates recommended zones, and made a maximum charge of 5 cents per call, with a reduction to 3 cents per call for all calls made within the zone

or to an exchange within 8 miles, after a guaranteed minimum number of calls had been used.

Certain changes were made in the toll rate, so that the rates charged in the metropolitan and suburban district fitted in with those in operation throughout the rest of the State.

Reduction in Toll Charges throughout the State.

In January, 1911, the company, with the approval of the commission, put into effect a reduction in the charge for short-distance tolls throughout the rest of the State, and reduced the charge from 10 cents to 5 cents per call for all calls made to exchanges not more than 5 miles distant.

New Schedule of Rates for the Whole State.

In 1911 a schedule of rates was approved for the whole State, which grouped the exchanges into eight groups, with a new schedule of rates, which is very simple and uniform, and which was to take effect throughout the State. This new schedule provided for better service, fewer parties on a line, and practically equitable and uniform rates for similar service for like communities throughout the whole territory.

This schedule was adopted by the company, and we understand it was put into effect gradually throughout the whole of the territory which it served.

New Schedules studied.

The commission's engineers had been studying traffic and the effect of the various new rates ever since they were put into effect, to see how they worked, and what, if any, changes could be made in them that would be of advantage to the public.

The Effect of the New Schedule of Rates.

The effect of the new rates, as is shown in that report, was to make a better class of service available for the smaller telephone users, at a much more reasonable price than under the old rates. Consequently, since then, fewer and fewer people have been using multi-party lines, and more and more sub-

scribers have taken two-party service with divided ringing, which greatly improves the whole service.

The changes recommended required large increases in the plant of the telephone company, as it made necessary very large additions in the number of wires and conduits, and also the number of switchboard positions. The company has been making these additions from time to time in order to take care of the largely increased demand.

New Rates bring an Increased Number of Telephones.

The report clearly shows that the new rates have resulted favorably for the community, and the very large increase in the number of telephones is very gratifying to the commission, as it proves that the rates have fairly met the needs of the community served. Not only this, but there has been a substantial reduction in the amount collected by the company per telephone.

Readjustment in Rates effects Substantial Reduction in Revenue.

When the new rates were recommended for adoption in the metropolitan and suburban district, it was estimated that they would make a reduction in the amount collected by the telephone company from the same number of telephones of about \$300,000 a year. This estimate has been found to be practically correct.

The average amount collected by the company for each telephone in the suburban district is about \$3.50 less for the years 1911 and 1912 than was collected in 1910, before the new rates were put into effect.

The number of telephones in the suburban district increased from 69,113, in 1910, to 88,295, in 1912.

In the central district, the company collected \$1.30 less per telephone in 1912 than was collected in 1910. The number of telephones had increased from 51,119, in 1910, to 59,658, in 1912.

The total number of telephones in the metropolitan and suburban district had increased from 120,232, in 1910, to 147,953, in 1912, an increase of 27,721 in two years. That this increase was caused largely by the new rates and not by an increase in population is clearly shown by the fact that in the Boston suburban district, in 1910, there were 9 telephones for

each 100 inhabitants, and that in April, 1913, there were 11.3 telephones for each 100 inhabitants.

The effect on the net revenue has been even more noticeable. While the number of telephones has increased about 50 per cent, the revenue has increased less than 38 per cent, while the operating expenses and taxes have increased over 40 per cent.

Increase in Telephones in the Metropolitan District.

Certain exchanges have shown very notable growth, all of which appears in the tables. The increase in the number of telephones since the commission began its investigations, in 1908, is very noticeable. The number of main stations in the metropolitan district in 1908 was 69,924, with a total number of telephones of 95,851. In April, 1913, the number of main stations in the same territory had increased to 114,789, and the number of telephones had increased to 160,539. This is an increase of over 67 per cent in the total number of telephones, all within five and one-third years. The average rate of increase was over 12,000 a year.

The tables show that the increase, particularly in some of the new classes of service under the new rates, has been very much faster than the average increase, notably in such service as the two-party line with divided ringing.

Increase in Telephones in the Whole State.

A similar growth in the number of telephones is shown throughout the State.

In 1908 there were 207,551 telephones in Massachusetts, and in 1912 this had increased to 316,840, an increase of over 50 per cent.

New Rates Popular.

In the metropolitan district certain rates have proved extremely popular. The two-party-residence-measured rate, covering the zone and adjoining metropolitan exchanges within 8 miles, which was put into effect in December, 1910, has already over 25,000 subscribers, showing that it provided for service and rates needed by the community.

The charts at the end of the report also show that this rate

and the two-party-unmeasured-zone rate have been much more popular than any other rates. Naturally, the service secured is very much better than could be obtained on multi-party lines.

The Results justify the Commission's Recommendations.

The commission feels that its recommendations have been amply justified by the results obtained. The community has secured a better telephone service at less cost on the average per telephone.

The number of telephone users has largely increased, showing conclusively that the new and lower rates have enabled many people to obtain telephones that could not afford them before. It is clearly shown by the figures that the new rates effected very substantial reductions.

The company is not now collecting nearly as much relatively, for the service performed and the plant required, as it was collecting before the new rates were put into effect.

New Rates prove Equitable.

A careful study of the charts and the report will show the effect of the new rates, both on the traffic and on the amounts collected per call from various classes of subscribers. The charts show that the new rates tended to equalize the amount collected for each call made between the various classes of subscribers, and to prevent the small users from being obliged to pay as large a part of the cost of the service given by the company as they formerly had to pay under the old rates.

Some Inequalities still exist.

The chart shows, also, that some inequalities still exist. A large number of users of unlimited business telephones, while they are not now securing quite as much at the expense of the other users of the telephone as they did under the old rates, are, nevertheless, still securing probably more than their fair share for the money that they pay.

The commission feels that it should publicly state that in the years during which it had the duty of supervising telephone rates, and of making recommendations concerning the same,

that the New England Telephone and Telegraph Company has invariably accepted the recommendations or suggestions made by the commission, and has done its utmost to put them into effect as soon as possible.

The company has several times adopted the recommendations of the commission and put them into effect when they were apparently of a radical and revolutionary character and there was much room for a reasonable difference of opinion as to what their effect would be in actual practice.

New Schedules of Rates Satisfactory.

That the schedules of rates recommended by the commission and adopted by the company have been satisfactory, and have satisfied the needs of the various communities throughout the State, is shown not only by the large increase in the number of telephones but also by the fact that there has been practically no petition for changes therein.

The four petitions presented, on all of which hearings were held, related to the establishment of exchanges and the territory covered, etc.

In 1912, after the new schedule of rates for the whole State had been adopted, there were only three hearings requested: —

One from the residents of Chilmark, Gay Head, etc., relating to farmers' lines and charges therefor on the Island of Marthas Vineyard.

One from the residents of Barnstable and Dennis relating to the location of exchanges, the connection of subscribers with particular exchanges, and the toll charges between such exchanges. The chief complaint — a charge of 10 cents was made between certain exchanges in the same town, because the exchanges were more than 5 miles apart — was met by the suggestion that the toll charge should be only 5 cents between any two exchanges in the same municipality.

A petition from residents of Marlborough and Hudson, protesting against the discontinuance of certain multi-party lines with unlimited service covering both districts.

It appeared that the new rates in that district were exactly the same as those in force throughout the State for like service

in like communities, and that a reasonable rate was provided for the service desired by the new one and two-party line service.

In 1912 the only hearing held, or requested, was in response to a resolve of the Legislature of that year, requesting an investigation and report as to conditions in the town of Barnstable. The investigation was made and a report was sent to the Legislature.

There have been no other petitions from any communities in the State during the years 1911, 1912, or to June 30, 1913.

The fact that no other petitions have been received and that no one has suggested that the new schedule of rates, or the plan as a whole, is unfair or inequitable, or that particular rates for certain classes of service are too high or should be changed, seems to be conclusive evidence that the new rates, as a whole, must be reasonable, the service satisfactory, and the needs of the community well provided for.

The commission takes this occasion to congratulate the company and the public on the results secured by the adoption of the new schedule of rates, which was recommended by the commission and adopted by the company.

MOTOR VEHICLES.

The automobile department, which is engaged in the registration of motor vehicles and the licensing of the operators thereof, including the collection of fees therefor, is under the charge of E. J. O'Hara. In this department there are from 50 to 100 assistants, clerks, stenographers, shippers, packers, etc., depending on the season of the year.

EXAMINATIONS AND INVESTIGATIONS.

This sub-department, which conducts all the examinations of applicants for chauffeurs' licenses, etc., and investigates motor vehicle accidents, is in charge of F. L. Austin. There are 9 other examiners and investigators employed in this work.

HIGHWAY DEPARTMENT.

This department has charge of all road and bridge work, advice to municipal authorities, etc. At the head of it is the chief engineer, A. W. Dean, whose assistant is S. A. Parsons.

The office engineering department, which makes the surveys, prepares all plans and estimates, etc., is in charge of A. M. Lovis. In this department are employed from 20 to 60 engineers, draftsmen, instrumentmen and rodmen, depending on the season of the year and the amount of work on hand.

The State is divided into four divisions, each in charge of a division engineer, and each division engineer has one or two assistants in charge of particular work, like "small town" work, maintenance, etc., and as many resident engineers are assigned to his division from time to time as are necessary to supervise and inspect the actual work which is in progress.

Division I. is in charge of J. A. Johnston, with headquarters at Springfield, A. D. Dudley being the assistant division engineer. This division includes most of Berkshire County, Hampden and Hampshire counties and a large part of Worcester County.

Division II. is in charge of C. H. Howes, with headquarters at Greenfield. This division includes Franklin County, a part of Hampshire County, and many towns in the northern part of Worcester County; also the road down Hoosac Mountain into North Adams.

Division III. is in charge of F. C. Pillsbury, whose assistant division engineer is D. H. Dickinson. The headquarters of this division are at Boston, the division including the eastern part of Worcester County, Middlesex, Essex and Suffolk counties and a part of Norfolk County.

Division IV. is in charge of W. R. Farrington, with W. P. Hammersley and H. C. Holden as assistant division engineers. This division includes part of Norfolk County and Bristol, Plymouth, Barnstable, Dukes and Nantucket counties, the headquarters being at Middleborough.

The work on the road from Charlemont to the top of Hoosac Mountain, through Cold River, is in charge of H. D. Phillips, assistant division engineer, especially assigned to the work.

Most of the principal engineers and assistants have been in the service of the Commonwealth for over ten years, and quite a number of them for a much longer period of time.

The several departments report to the commission through its secretary, F. I. Bieler. His assistant is Fred Fair.

The records of the commission, etc., are in charge of the recording secretary, Miss Mary A. Riley. The accounting department is in charge of J. M. McCarthy.

HEARINGS.

During the year 308 hearings were given on automobile complaints and accidents and matters relating to the registration and operation of motor vehicles.

Public hearings were given on special regulations by municipal authorities affecting the use and operation of motor vehicles in Topsfield, Beverly, Newburyport and Nantucket.

There were 26 hearings given on petitions for the location, extension and relocation of street railways on State highways.

In addition to the regular hearings held in each of the 14 counties, the commission gave many hearings on petitions from various cities and towns for State highways or for aid in the improvement of town ways.

Besides these formal hearings given at the office or elsewhere to the authorities or representatives of the cities or towns, one or more members of the commission met the municipal authorities or inspected the roads to be built or improved by the municipalities or otherwise, in more than three-quarters of the towns in the Commonwealth.

STATE HIGHWAYS.

During the year ending Nov. 30, 1913, the commission completed work on about $49\frac{1}{4}$ miles of State highway, portions of which were laid out in 1912. Construction was commenced, but not completed, on over 31 miles of roads in 30 towns. Layouts were made of about 60 miles of State highway in 62 towns. The total length of State highways at the end of the year was 980.37 miles.

The total expenditures by the commission for the construction of State highways since the work began, including the planting of trees, amounts to \$9,288,143.35. It must be remembered that the counties repay to the Commonwealth one-fourth of the cost of constructing these highways. The money so repaid has been used in the reduction of the bond issue, and, consequently, the State bonds are outstanding for a much smaller sum of money.

Until the present year there has been only \$500,000 a year available for the construction of State highways and for the work on "small town" roads, \$75,000 of that amount going into the towns. The Legislature in 1912 authorized the expenditure of \$5,000,000 during the next five years, not more than \$1,000,000 to be spent in any one year for the above purposes. One hundred and fifty thousand dollars of this amount is to be expended upon the "small town" roads, \$100,000 of which is only available in case the towns contribute a like amount.

PETITIONS.

There were 898 petitions filed by the city and towns for the laying out of State highways before this year, these petitions covering 2,110 miles of road. This year 22 petitions were received, covering 66 miles of road, making a total of 920 petitions, now on file, covering about 2,175 miles of road in 30 cities and 294 towns.

CO-OPERATION BY MUNICIPAL AUTHORITIES.

For the past few years there has been a constantly increasing interest in the securing of good roads. The city and town officials have consulted with the Board and its engineers, and have requested engineering advice to such an extent that at times the commission has been unable to furnish plans, estimates and specifications, or do more than send an engineer to give advice, because its own force had already more work on hand than it could possibly attend to. The cities and towns have co-operated most generously with the commission, and very many of them have made appropriations, to be used with money furnished by the commission and expended in building roads. Many of the counties also have been interested in the improvement of roads under the direction of this Board, and have made appropriations to help the work along, in many instances the money appropriated by the town and county having been used with the money allotted by this commission in the construction of roads built under the direction and supervision of its engineers.

Essex County built the Lowell-Dracut Road, and Lynnfield Street in Lynn; has helped on the Newburyport Turnpike work;

and is to co-operate in the construction of Humphrey Street in Swampscott.

Middlesex County is helping in Sudbury, and has been helping on various roads in Concord, Wayland, etc. They also offered to give aid on the Bedford-Carlisle Road.

Bristol County has offered to help on the road in Freetown.

Plymouth County is helping on the Wareham bridge.

Barnstable County has made several layouts and improvements in location, not only in connection with the Cape Cod Canal but in improving the location on other roads.

Dukes County has agreed to pay \$7,500 toward the cost of building five miles of road in Chilmark and Gay Head.

Worcester County has for several years been co-operating in the improvement of various roads where work has been done under the supervision of this Board. Work has been done on the road between Worcester and Athol in Paxton; also on the road in Sturbridge between Southbridge and Palmer, and the commission, county and the towns have been improving the road from Fitchburg toward Keene, N. H., via Winchendon, in the towns of Westminster, Ashburnham and Winchendon.

Franklin County made a layout to go up Cold River, and co-operated in the construction of Scott's bridge at the Buckland-Charlemont line.

Hampden County has provided money for the improvement of a road in Hampden.

Berkshire County has assisted on various roads, as in the past, putting money into the improvement of the road between Pittsfield and Williamstown, in New Ashford and Lanesborough. It also furnished the layout for the road over Hoosac Mountain, in the towns of Florida and Savoy.

The great feature of this work is the increased interest in the cities and towns, and the amounts of money which they have appropriated, some of it in building their own roads, to connect up with the State highways on main lines, and in other instances appropriating money to be put with the State's money in improving the through roads.

The amount of money expended under the direction of the commission and its engineers is over four times what it was five years ago, if account is taken of the money spent by the

municipalities in connection with the work done by the Board, and also the money expended by such municipalities where the commission furnishes the specifications and supervises the work when none of the money is furnished by the Commonwealth.

Five years ago \$650,000 was available for construction and maintenance. This year \$1,000,000 was available for the construction of State highways and "small town" roads; about \$700,000 available for the maintenance of State highways from the tax levy and from the motor vehicle fees fund; and \$138,000 from the motor vehicle fees fund was available on through routes in towns. In connection with this work the municipalities contributed nearly \$212,000.

Besides this, the commission was required by special acts of the Legislature to construct or improve various highways in different parts of the State. There was \$630,000 made available by such special acts, making a grand total of about \$2,690,000 to be expended under the direction of the commission, besides superintending several pieces of work for which the State contributed nothing.

Something over \$3,000,000 expenditure in all is to be made under the supervision of the Board and its engineers, and under specifications furnished to the municipalities where they work constructing roads and bridges with their own money.

The whole force, both in the office and in the field, has been taxed to the utmost. All through the country, because of the great interest in the improvement of roads, and the tremendous sums appropriated, it is becoming more and more difficult to secure the necessary men who have the requisite education and practical experience in road building. Nearly every officer and employee has had to strain every nerve and work long hours, to keep the work progressing as well as possible. Doing work, as they have, in over 222 cities and towns and supervising work in others, it has been almost impossible for the engineers in charge to get around often enough to inspect the work that was going on.

The commission feels that great credit is due to all the persons connected with the work in every department, who by their tireless efforts accomplished such a large amount of work in such a short time.

To increase from an expenditure of \$650,000 a year to one of over \$3,000,000 a year in five years, without a corresponding increase in the working force, and to secure good results, are certainly worthy achievements for any office or any force, and the Commonwealth is to be congratulated on having in its employ men and women who have accomplished this task.

CHARACTER OF CONSTRUCTION.

The Board has continued its policy of making the main roads wider, usually building 18 feet of stone surface, instead of the 15 feet which was formerly the standard width. It has also continued to use on such roads some bituminous binder in construction, and has been reducing the crown of the road to about 1 inch to the yard in width, not only to make the roads less slippery, but also that the traffic will distribute itself over the whole width of the road. This additional width and the bituminous binder, which must now be used, increase the cost of construction from 50 to 75 per cent. The eight-hour law and the workmen's compensation act have also largely increased the cost.

The increase in the traffic, especially in motor trucks and automobiles, makes this additional width and more expensive construction absolutely necessary.

Of the State roads completed in 1913, 22 $\frac{1}{4}$ miles were of bituminous macadam; 9 $\frac{1}{2}$ miles were of water-bound macadam (which is, or will be, coated with some bituminous binder); 4 miles were of gravel; 4 $\frac{3}{4}$ miles of sand bound with heavy asphaltic oil; 3 $\frac{1}{4}$ miles of macadam coated with hot asphaltic oil; 3 miles of bituminous gravel; 2 miles of concrete; and one-half a mile of granite block on a concrete base.

Further details regarding the methods of construction used will be found in Appendix A, the report of the chief engineer.

LOCATION OF STATE HIGHWAYS (THROUGH ROUTES).

Western Massachusetts.

The commission has continued its policy of filling in the gaps as rapidly as possible on the main lines of travel, building the roads on the through routes in the smaller and poorer towns

which could not afford to build them. In the communities which were able to help themselves, the commission has co-operated wherever possible.

The counties, the cities and the towns have co-operated and built connecting roads, or made appropriations to help in building and improving roads on main routes to a much greater extent than ever before. The amounts so appropriated and expended are certainly twice, if not three times, as much as the average amount spent in former years; and while in the past some quite large appropriations have been made by one or two rich towns, now most of the counties are co-operating, and nearly half the municipalities have also appropriated.

Following this policy the north and south routes in Berkshire County have been built upon to connect Connecticut and New York points with Pittsfield, North Adams and points in Vermont.

State highways have been laid out in Sheffield and Cheshire, and the road in Clarksburg, leading from North Adams to the Vermont line, has also been improved.

The city of Pittsfield has helped most generously, building a bituminous macadam road, costing about \$25,000, to connect the State highway leading from Dalton to Pittsfield with the State highway in Lanesborough leading to North Adams. This road, when constructed, the commission agreed to lay out as a State highway, because it was on the main route, and this has been done. The whole route between Pittsfield and North Adams is now nearly completed.

Much work has been done in improving the secondary north and south route up the Berkshire Valley going to Williamstown, and a full account of the work will be found elsewhere in this report.

The city of Pittsfield also agreed, if the commission would build a short piece of State highway to fill a gap on the road to Albany, that it would build to connect at the Richmond line with the State highway leading to that town. The commission furnished the plans and specifications for both these roads, and they have been constructed. The Richmond Road is about 1 mile long, and cost some \$14,000. It is a bituminous macadam road, built of local stone, with a heavy asphaltic binder.

Albany-Springfield.

This Board has fulfilled its agreement with Pittsfield by laying out, as a State highway, the gap that existed between two former layouts on the main road to Albany. This involved the construction of two reinforced concrete bridges, the old bridges not being strong enough for modern traffic, and the construction of about five-eighths of a mile of bituminous macadam, most of it upon a stone foundation. This cost \$20,000, including the bridges.

The work has been continued in filling in the gaps on the road to Springfield over the so-called Jacob's Ladder route, via Lee, Chester and Westfield.

The State highway in Becket, which was begun last year, was completed and opened to travel this year. The highway was, in part, relocated to improve the corners and grades and to secure a good alignment. A stone foundation was necessary in many places, and about \$45,000 was expended. The road was built of local stone, which was not of very good quality, but was the best material available.

A layout was made in Lee, extending this road towards Becket, and the work was pushed so rapidly by the contractor, and such excellent work was done, that two extensions were made, so that $2\frac{1}{4}$ miles of road will be completed early next season, thereby filling the gap between previously constructed State highways on that line.

In many places the alignment of the old road was bad, and it was relocated. In many places it required a stone foundation, which made the construction expensive. The road is made of bituminous macadam, consisting of local stone with refined tar as a binder. Here, also, only local stone was available, and it was quite soft in character.

The road through the village of Huntington, on this main road was in bad condition, largely because of the constantly increasing traffic. The town could not afford to construct it entirely at its own expense, so it agreed to co-operate, and asked the Board to assist. The town of Huntington appropriated \$1,250. The Board allotted an equal amount from the small town fund, and \$3,600 from the motor vehicle fees fund, making available \$6,100 in all.

Other Berkshire and Connecticut Valley Routes.

A great deal of work has been done in the last few years on the other two routes connecting the valley of the Connecticut with the Berkshire valley. One route is in the middle of the State, connecting the city of Northampton with Pittsfield, via the towns of Williamsburg, Goshen, Cummington, Windsor and Dalton. A full account of the work done on this route will be found elsewhere, under the "Dalton-Goshen Road." The other route is in the northern part of the State, connecting the town of Greenfield, over Shelburne Mountain, with the city of North Adams. The work done on this route is described under "Shelburne Mountain," and also in the description of the work on the highway between the Deerfield valley and the city of North Adams, and on the highway leading down Hoosac Mountain to the city of North Adams. The work on this route has been done, in part, with special appropriations made by the Legislature, in part by the towns and the city of North Adams, and, in part, by the Board with money obtained from the various funds at its disposal.

Connecticut Valley.

For several years the Board has been trying to get one through route, north and south, in the valley of the Connecticut. This route connects Hartford, Conn., through Springfield, Northampton and Greenfield, with Brattleboro and other Vermont points. A great deal of money has been expended on it, and work has been going on for many years until now it is practically completed.

The route to Springfield on the west side of the river, via Agawam, has been completed for some time.

On the east side of the river, there was quite a long gap in the town of Longmeadow. Longmeadow made a new layout, relocating and widening the highway and improving the grades. Work was begun last year, but could not be completed because the construction on the new location was not completed, and it was necessary to wait to let the road settle where it was filled.

The town laid out the highway, and by agreement the commission was to supervise the construction, and pay for the construction of 18 feet of surface in the middle of the roadway, the

town paying for all grading, widening, land damages, etc., also for the construction of 6 feet of bituminous macadam on each side of the 18 feet, making the traveled part of the road 30 feet in width.

As this road has extremely heavy traffic and many motor trucks, the Board thought it was a good plan to try the experiment of building a concrete road, and, if it proved necessary later, covering it with a surface coat of tar. This work could not be commenced until late in the year, after the grading was completed and had settled. It has been completed and is now open to travel, connecting with a State highway in Connecticut at the State line.

There was a very bad stretch of road on this main route in the city of Northampton and the town of Easthampton. The road was low, and often flooded, and the soil extremely bad, so that often it was practically impassable during the winter and early spring. Because of these conditions, it was a very expensive road to build. Negotiations have been in progress for several years with the city of Northampton. An agreement was reached in 1912, whereby that portion of the road which was in that city should be constructed at joint expense.

About $1\frac{1}{2}$ miles had to be built, and under the agreement the city was to pay for the grading, drainage and land damages, if any, and the State was to pay for a roadway 18 feet in width. A contract was let last fall, and the work was begun and has been going on this season, the road being completed and opened to travel early this fall. The contractor did not make as rapid progress as should have been made, and consequently the road was not completed on time. This piece of road cost about \$37,000, the Commonwealth's share being \$25,000 and the city's, \$12,000.

The city also agreed to construct a short stretch of road, on this same route, on the road leading north towards Hatfield, and this has also been completed.

There was about one-half a mile of road in the town of Easthampton, which was also extremely bad, and had to be constructed to fill the gap on the road to Holyoke. The town of Easthampton appropriated \$3,000 and this piece of road, costing \$7,000, was constructed in connection with the work on the

Northampton portion of the road. The whole road was substantially widened and the grade was raised. The only material available was of such a nature that a stone foundation was necessary for practically the entire distance. Upon this a bituminous macadam road was constructed, made of trap rock, 4 inches thick, the top 3 inches being bound with a heavy asphaltic binder.

Resurfacing in Holyoke.

The State highway in Holyoke on this route was altogether too narrow for the greatly increased traffic which was using it, and as it was used by many motor trucks, as well as very large numbers of automobiles, it was necessary at this time to widen and resurface it in order to make it adequate for this traffic. Some of this road was only 12 feet in width.

A contract was let for reconstructing some 4 miles of road, making the hardened surface 18 feet in width wherever possible. The old road was scarified, as much new stone was rolled in as was needed, and the whole road coated with a bituminous binder. On a portion of it refined tar was used, and on a portion a heavy asphaltic binder. The work was pushed with great rapidity by the contractor, the whole 4 miles being completed and opened to travel in six weeks. This work cost about \$24,000.

The State highway in Whately on this route was only 12 feet in width, and \$6,000 was allotted for widening this road to 15 feet, and resurfacing it with a bituminous macadam. A refined tar was used.

Gaps filled.

There were several short gaps in this main line, which had been left out of the State highway locations, in part because of bad railroad crossings and underpasses.

The Board has been trying to secure the improvement of these crossings as rapidly as possible.

It did not seem fair to the traveling public to leave these rough stretches of road, so the Board has improved them, using money available from the motor vehicle fees fund. Some of them, where the crossings have been improved, have been or will soon be laid out as State highway.

Vermont and New Hampshire.

In 1912 the Board allotted \$15,000 for building between Gill and Northfield on this route. This work was completed this year. A most excellent quality of gravel was available, and if coated with oil it is believed that it will carry the traffic, which consists very largely of automobiles, for several years to come.

From Northfield north to the State line where the New Hampshire State highway begins is a distance of 1 8-10 miles.

The Board agreed with the town authorities to build from the line south towards the village to the drug store corner, so called, if the town would build the short stretch necessary to fill the gap to the existing macadam road. The town agreed to do this, and the whole work was advertised, let and constructed under specifications furnished by the Board, and was supervised by its engineers.

The construction was quite expensive, not only because a part of the old highway was too low and was flooded at times, so that a deep fill was necessary, but also because some of the corners were very bad, and the road had to be relocated and the grade improved on a very bad hill.

The commission allotted \$23,500 for this work, and the town expended about \$4,000 on its portion. A macadam road was built of trap rock, and should have a bituminous treatment before long.

This whole route is now completed to the New Hampshire line, and connects there with the State highway in that State leading to Brattleboro, Vt., also to Keene, N. H.

There is also another route leading to Brattleboro, Vt., on the west side of the river, leading from Gill directly north through Bernardston.

The road in Vermont has not yet been constructed, and is not in very good condition, consequently, the route via Northfield and New Hampshire was selected.

South Hadley-Amherst-Deerfield-Sunderland.

An important route on the east of the Connecticut River connects Holyoke in the south with Deerfield in the north. The South Hadley road has been completed this year through the co-operation of State and town.

Amherst co-operated heartily, as it has in the past. Four thousand dollars was appropriated by the town, and an equal amount was allotted by the Board, to build from the Boston & Maine Railroad crossing southerly towards South Hadley. The town spent \$4,500 more in building from the railroad crossing towards the center of the town.

The Board laid out and built a mile from the Sunderland line southerly in Amherst at a cost of \$9,100, and a mile from the same line northerly in Sunderland at a cost of \$10,000.

Holyoke-Belchertown.

The Board has constructed in Granby about a mile and a half on this route, at a cost of about \$12,000, and hopes to complete this road in the next two years.

Springfield and Worcester to Boston.

On this main route several gaps have been filled, the town of West Brookfield having co-operated by contributing \$1,500 toward building about one-half mile of road through the village connecting the two pieces of State highway.

Work has been done on Leicester Hill, the town furnishing a part of the money, about \$1,900, and the State about \$3,200. This hill is and always will be very bad. The grade is too steep, and cannot be improved. What is needed, and has been for many years, is a new route around the hill. This Board has been trying for many years to secure this by co-operation with the town authorities, so far with but little success. The matter is now pending before the Worcester County commissioners, the Board having offered to construct a bituminous macadam road 18 feet in width, around the hill, if the county and the town jointly, or either of them, will secure the right of way and pay land and grade damages, and also furnish, or pay for, the necessary subgrade and drainage.

For the benefit of the traveling public, so many of whom have to use this road, it is to be hoped that this much needed improvement can be secured next year. The balance of the work on this route has consisted of resurfacing certain of the most worn-out places, strengthening and widening. The travel on this whole route has increased many fold in the last few years. Many

days it is used by 500 to 800 automobiles, and also by very many motor trucks.

The curves and corners are extremely bad in many places, accidents are frequent, and the stone surface is only 15 feet in width. On very many miles the old macadam is fully one-half gone. It has been coated with some bituminous binder, and constantly patched and kept in reasonably good condition, but it is not strong enough to carry the traffic that uses it, especially the motor trucks. It should be widened and reconstructed with a stronger surface in the near future.

The same is true of many other main routes, especially near Boston, where the travel is heavy and constantly increasing, like the routes to Providence, Taunton, New Bedford, Fall River, Brockton, Middleborough, Plymouth, Newburyport, Gloucester, Haverhill, Lawrence, Lowell and New Hampshire, Concord, Fitchburg, etc., also as well as many miles on other highways with heavy traffic.

The Board widened and resurfaced nearly 2 miles in Weston, on the main line near Boston, continuing last year's work, and also on the road from Worcester to Leicester.

Greenfield and Fitchburg to Boston.

The road between Greenfield and Fitchburg has been completed with the exception of a mile or two in Erving. For several years a power company has been contemplating building a dam, which will flood the present highway. This will make an entirely new location necessary, so that it has not seemed advisable to build upon the old highway. The matter should be settled one way or the other very soon, so that the missing link can be completed.

Athol.

In the town of Athol the gap between the State highways, mostly located in the village, was in bad condition. The town appointed a special committee to investigate and report what ought to be done to improve the whole length of road. The Board was asked to furnish engineering advice. This it did; also drew the specifications and supervised the construction under the contract let by the town.

The Board agreed to co-operate by constructing a piece of high-

way on the easterly side of the village, to connect with the State highway there, and allotted \$12,000 for the purpose. The town appropriated \$54,000, to build over 2 miles through the village. A portion of this road was constructed of granite block on a sand base, another portion was of brick on a concrete base, and the balance was made of bituminous macadam. The work has been completed.

Fitchburg-Boston.

Work has been going on, on this route, via Concord, for several years. Last year the commission allotted money and made layouts in Littleton and Ayer, and the work has been completed. This year it made a layout in Littleton on the road leading towards Ayer, allotting \$13,000 for the purpose, and the work has been completed. This road was constructed on a gravel foundation with a bituminous macadam top made of trap rock and bound with asphalt.

On this route the bridge over the Nashua River, on the line between Ayer and Shirley, was an old wooden one, and was not safe for travel. It was not nearly strong enough for heavy motor trucks, one of which broke a like bridge between Ayer and Shirley last year. This bridge has since been rebuilt. The selectmen of the two towns were seen, and as it was evident that a new bridge must be constructed, an agreement was entered into for the construction of a concrete beam bridge with a pier in the middle, each town agreeing to pay \$1,500 towards the cost of its construction.

The commission agreed to lay out a section of State highway on this same road, and allotted \$25,000. A contract was let and the work is going on very satisfactorily, and will be completed in the spring.

This highway to Fitchburg runs through Lunenburg, and there were about $1\frac{3}{4}$ miles in that town which had to be constructed. A State highway was laid out and a contract let for a portion of this work, \$12,000 being appropriated.

The work was pushed so rapidly that \$13,000 more was allotted later to continue the work, and this piece of road is open to travel and practically completed. This road was built of bituminous macadam, made of local stone, with asphalt used as a binder.

The old State highway in Lunenburg was practically worn out, and was entirely inadequate to withstand the traffic which would go over it as soon as this route was completed. The commission, therefore, resurfaced a part of it at a cost of over \$9,000.

A few more miles of road on this through route must be constructed before the whole route from Boston to Fitchburg is completed.

The town of Littleton also co-operated on this route by paying one-half the cost of building a piece of road between Littleton village and Littleton station, the cost of which amounted to about \$4,000, the commission drawing the contract and supervising its construction.

Fitchburg-Keene, N. H.

There is no good route between these cities, and there certainly should be. The mayor of the city of Fitchburg agreed that that city would build the road in West Fitchburg to the Westminster line.

The Board took the matter up with the county commissioners of Worcester County, the city and town authorities, and other interested parties, to see if some agreement could not be made whereby this whole road could be improved in the near future.

The county commissioners of Worcester County were much interested in having the route improved from Fitchburg, along the River Road, so called, through parts of Westminster and Ashburnham to Winchendon, and agreed to co-operate and contribute. Surveys and estimates were made last year. The county commissioners agreed to put in \$2,250 towards the completion of the road in Westminster and Ashburnham; the town of Westminster, to put in \$1,000; the town of Ashburnham, \$4,500; and the commission, the balance of the cost of constructing a country road of proper width, with the necessary culverts, using the best gravel obtainable.

The town of Winchendon agreed to pay one-half the cost of building a gravel road from the Ashburnham line towards Winchendon. A gravel road, of a very fair quality, has been built, and has been open for travel this fall.

The length improved was about 9 miles. The cost was \$28,000, apportioned as follows: the Commonwealth, \$15,250; the county of Worcester, \$2,250; the town of Winchendon, \$5,000; the town of Westminster, \$1,000; and the town of Ashburnham, \$4,500.

The allotments made by the Board were made from the small town funds and from the motor vehicle fees fund.

It is expected that the road will be continued on this main route next year by improving the road from Winchendon to the New Hampshire line, the town officials having intimated to the Board that they will pay their fair share of the cost.

Fitchburg-Worcester-Providence.

State highways have been laid out on this route to complete this main line.

In Sterling a contract was let for work last year, south of the town, and this work has been completed.

This year the town agreed to co-operate by building the road through the village, about 1,800 feet in length, of bituminous macadam, and appropriated \$5,500, the Board furnishing the plans and specifications, and supervising its construction.

The Board allotted \$12,000, and laid out a State highway north of the town, on the road leading to Lunenburg.

Both of these pieces of road have been constructed, and are open to travel.

A layout was made in West Boylston on the route to Worcester, and \$12,250 was allotted. The contractor was very slow, but the road has been finally completed.

South of Worcester, on the route to Providence, the work has been continued this year in Grafton, the town contributing \$3,000 towards its cost, and the Board allotting \$24,000.

In Northbridge, also, on the main line between Worcester and Providence, the town agreed to build about half a mile of road in the village of Rockville, and the commission allotted \$10,000, to build from the Grafton line south to the village. A good many miles of road remain to be built in Northbridge, and it is expected the town will continue to co-operate, as have the other towns on the line, so that the whole route can be completed in a few years.

On this route, in Uxbridge, the town has for many years co-operated with the Board in building and improving roads.

In the town of Blackstone there was a very bad piece of road on this line, as well as a bridge that was unsafe and needed reconstruction. Plans and estimates were made by the commission for the construction of the bridge and roadway, and an agreement made with the town whereby the work should be done under one contract, the whole length being laid out as State highway. The town agreed to pay one-third of the cost of the whole work, not to exceed \$8,500, and the Board agreed to pay the balance, and allotted \$20,000 for the purpose. The contract for this work was let late in the year, but it has progressed very rapidly, and will be completed early next year. This completes the Blackstone end of the road to the Rhode Island line. All of these pieces of road were constructed of bituminous macadam, a foundation being put in where necessary.

Worcester County.

The Board has also been attempting to complete certain other roads leading into Worcester.

On the road to Southbridge, it has been building in Charlton, the town building a short stretch of road on the route.

In Sutton, early in the year, the town and this Board each allotted \$2,000, or \$4,000 in all, for the construction of the road leading towards Douglas, and later in the year the work was progressing so well that the town requested the Board to continue the work. The commission had no funds unallotted at that time, but it agreed to equal any appropriation made by the town to continue the work. The town allotted \$5,000 for this purpose, and the commission has allotted, out of 1914 funds, \$5,000 to go with it, making \$14,000 in all spent upon this road.

The Board has also been constructing, or helping to construct, on many other lines of secondary importance in Worcester County under the small town act and under chapter 525 of the Acts of 1910.

Boston and the North.

On the main line between Boston and Lowell, work has been continued in Woburn, \$6,500 being appropriated, and a slight extension was made afterwards at the request of the mayor, to complete the road to a certain point. It was understood that the city of Woburn would build the balance of the road from where the State highway stopped.

An allotment of \$6,000 was made to fill a small gap, and build a bridge in Tyngsborough, on the line between Lowell and Nashua, N. H.

Work has been done in Billerica on the line to Lowell, the town and the Board each putting in \$2,500.

In Dracut work has been continued on the road leading north from Lowell to the New Hampshire line.

On the line between Boston and Salem, in Revere and Saugus, there has been a State highway over the marshes for many years, but the connecting road in Revere, as far as Revere Street, has been almost impassable. The Board made an allotment of \$15,000, to construct about one-half a mile of State highway on this route last year, but, before it was built, it was necessary that all the water, gas, sewer and other pipes and connections should be made. The matter was taken up with the town authorities, and this work was done. The town, also, in connection with this work, laid a granite curb.

As this is a road with very heavy teaming, and already carries from fifty to seventy-five motor trucks a day, a very strong and durable road was necessary. The bottom was bad also, consequently, granite blocks, grouted with concrete and laid upon a concrete base, were used, as the Board believed that this type of construction was necessary to carry the traffic, and would prove economical in the long run.

Work has been completed in Essex to the Gloucester line, \$10,000 being allotted for the purpose.

New Hampshire Route.

A layout was made necessary in Salisbury, on the road leading to the beach, and \$12,200 was allotted to build this section. The town took the contract, and the work is substantially com-

pleted. This road is on the main line from Lowell, Lawrence and Haverhill to the beach. At the New Hampshire line, the road is a State highway, and the route is much used by tourists.

The road along the beach has been built under a special act of the Legislature, and is described elsewhere.

There are about $11\frac{1}{2}$ miles more to be built to complete this road.

Salem-Lawrence.

Last year the commission made a layout in Middleton on the main line between Salem and Lawrence, building a bituminous macadam road. This year it made another layout on this route, in Middleton, allotting \$12,000.

It also made quite a long layout in North Andover on this route, allotting \$33,000.

In North Andover the old highway was over a very bad bottom, and drainage conditions were extremely bad. The Board decided to try the experiment of building a concrete road.

Concrete roads have been built during the past years in many States, notably in and around Detroit, Mich., where many miles have been built during the last four years, and so far, when well built, have proved economical and satisfactory.

This seemed a good place to try the experiment of building such a road upon a poor soil for foundation. It will undoubtedly be thrown somewhat by frost, and will develop cracks, but in Detroit the cracks or defects have been filled with tar and sand, and while in the patches this interferes with the looks of the road, the patches last and the roads are still in good condition. One of them is now over four years old, and over two thousand vehicles pass over it daily, many of them being heavily loaded teams.

Had it not been for this experience in other places neither the Board nor its engineers would have thought of constructing a concrete road under the conditions that existed in North Andover. The experiment was tried because any other kind of road would have required much more excavation and the putting in of a foundation of stone or other suitable material. This would have made a bituminous macadam road cost more than one of concrete.

We shall watch the experiment carefully, though with some doubt as to its success. Some reasonably economical method of building roads that will stand up and carry the tremendous motor vehicle traffic which has developed, and strong enough not to break up under heavy motor truck traffic, must be discovered in the near future, or our roads will be rapidly destroyed by this truck traffic.

In 1906 the commission built about one-half mile of concrete road in the town of Spencer, the grouting method being used, and this road is in very good condition at the present time. This first concrete road was only 15 feet wide, and was made with nearly the same crown as we were using on water-bound macadam, three-quarters of an inch to the foot. There were many complaints of its being slippery for horses, largely because of this crown. While most of the concrete wore well, some small holes did develop, and these were patched with tar.

In 1908 it was decided to coat this whole road with refined tar covered with sand or pea stone, both to prevent the further development of pot holes and to give a better footing. This surface wore very well and only required some slight patching until the year 1910, when another surface application of refined tar was put on. A third application has been put on this year. The traffic on this road, however, is very largely automobiles, and there are not many heavy horse-drawn vehicles.

Newburyport Turnpike.

This is one of the old stage routes, laid out in a straight line, up and down hills, and is the shortest route between Boston and Newburyport and points in Maine and New Hampshire. During the past four years the commission has been improving this road, taking the worst places first, and widening, grading and surfacing with gravel.

The road is in eight towns, and runs through the open country. It has been improved with money obtained from the motor vehicle fees, \$26,598 having been put in by the commission up to this year, and over \$2,000 by three of the towns, making \$28,598.

This year the work was continued, all the towns co-operating towards the maintenance and construction. Over six miles of

the road were widened and resurfaced with gravel in 7 of the towns, the Saugus road being already completed. Twenty-six miles of road were shaped and patched, and additional gravel used where necessary. The work of shaping and patching was kept up constantly all the season, a number of repairmen being kept continuously at work.

The travel increased so much, and the speed at which the automobiles were operated was so great, that the road could not be kept in good condition by this method alone. Consequently, it was oiled for over 17 miles, two coats of light oil, of about one-fifth of a gallon to the square yard, being used.

The Board spent upon this work \$10,550, and the towns contributed \$5,170, making \$15,720 in all.

The amount contributed by the towns was as follows: Newbury, \$800; Rowley, \$300; Topsfield, \$1,300; Ipswich, \$250; Danvers, \$500; Peabody, \$880; Lynnfield, \$590; and Saugus, \$650.

During the last four years the commission has spent over \$37,000 from the motor vehicle fees on this road, and the towns have spent \$7,470, a total expenditure of \$44,470.

Now that the whole road is in good order, it is being used more and more by automobiles as a through route. It will probably have to be oiled for its entire length next year, if it is to be maintained in good order, and the commission expects the towns to co-operate and pay their fair share towards its maintenance. This is the longest, but only one, of many main through routes which could not have been improved if the motor vehicle fees had not been available for use on such through routes.

The towns are but little interested, as, except in Saugus and Lynnfield, the road only passes through an unsettled country and is little used for local traffic. •

Acton-Concord.

A good many miles of State highway had been constructed in Acton, Boxborough and Harvard, but a very bad stretch of road was left in Acton and Concord, which was necessary to connect these towns with the State highway near the Concord reformatory.

Last year a section of this road was built in Acton. This year an allotment of \$9,000 was made to continue the work, and later in the year a further allotment of \$25,500 was made to complete the road in Acton to the Concord line and fill in the gap in Concord.

The first contract is completed. The work on the second is nearing completion, and will be finished early in the spring, thus completing what will be done on this route for the present.

Boston and Providence.

The commission allotted \$16,000, to extend the State highway from the Westwood line in towards the town of Dedham to where the village begins. It was understood that the town would continue the work on this line, building a good road into the center. The road was very narrow and a part of its width was occupied by a car track, consequently, it had to be substantially widened, the electric car track relocated, and the whole street reconstructed, which made the work very expensive.

The town assumed all the land and grade damages, and a bituminous macadam road was built with 18 feet of macadam, and 3-foot shoulders on each side.

In Norwood and Westwood on this line there were short stretches of bad road, which had not been included in the State highway locations because of the conditions under the railroad bridges. These conditions having been remedied, the short pieces of road have been constructed and laid out as State highways.

Boston-Taunton-New Bedford.

On this main through route, the commission has been co-operating with the town of Easton in building a section of road 1.09 miles long, costing \$10,620.80, of which the town paid \$6,620.80, and the commission \$4,000. While this money was available last year, the road was not completed until this year.

In 1912 the Board built a section of State highway in Raynham on this main line to Taunton, and again this year it allotted \$18,000, to continue the work on this line, the town of Raynham having appropriated \$2,500 for use on the same road. The work

is nearly completed, making a good road from Boston to Taunton.

The city of Taunton has been co-operating in securing a good road to New Bedford. For two years it has been building sections of road on this line from a point agreed upon between the city and the Board, the understanding being that the city would build about 1 mile of road, and that we should lay out a State highway there, and in the town of Berkley, to connect with the State highway already built in that town.

A contract was let for a section of road in Taunton, and later a further allotment was made to continue the work, and a second contract let for finishing the Taunton-Berkley road. Altogether, \$25,000 was made available for the work.

Taunton-Fall River.

The road in Taunton, on the main line to Fall River, was narrow and needed widening and construction.

Some years ago this Board offered to build a section of State highway there if the city would widen the road, relocate the car tracks, and pay the land and grade damages. This the city did not do at that time.

This year, however, the mayor took the matter up with the Board, and the city agreed to widen the layout and provide the right of way, and requested this Board to build a short section of the road, the city on its part agreeing to complete the construction of this road towards the city to where the street was in good condition. The Board agreed to do this, and allotted \$4,000.

A few bad places still remain on this road, especially some bad corners in Dighton, which should be improved by the town. The Board has offered to co-operate by building a piece of road on the south of the town if the town will widen and relocate the streets at these corners, and will construct the road through its village.

The present conditions in the village are extremely dangerous, especially considering the number of vehicles that have to pass over the streets.

When this work is done there will be a good highway from Boston to Fall River.

Fall River-Providence.

The Board continued its work on this line, allotting \$10,000, to build a section of highway in Seekonk.

Boston, Plymouth and the Cape.

The main shore line to Plymouth is completed, and for several years the Board has been making layouts on the extension of this route towards Bourne. When this line is completed, it will be much used by automobilists going to points on the Cape near Bourne, or beyond, because it is a most attractive seashore route, and is somewhat shorter than the route via Middleborough and Wareham. It is about 19 miles from Plymouth to Bourne, and there are no railroad facilities in that locality.

Stone is not available, consequently, the only type of road which could be built at any reasonable expense is one made of sand mixed with some bituminous binder. The Board has for several years been using a heavy asphaltic material heated, and mixed with hot sand, securing a reasonably satisfactory road.

In Plymouth 2 miles of road were laid out, \$18,000 being allotted. The contract was let to the lowest bidder, but the work has been unreasonably delayed. Too much of the road has been torn up and left in bad condition by the contractor. The work has been extremely unsatisfactory, not only to the Board but still more so to the traveling public. It is true, however, that the contractor had trouble with the first hot mixer which he tried to use, but the real difficulty was that he did not plan, or execute, his work properly.

When it became evident that the road on the north side of the canal in Bourne would not be completed by the canal company in time to settle, and be in proper condition for the construction of a State highway this year, the Board made the \$10,000, already allotted, available for work on the Bourne-Plymouth road. A contract was prepared and let for the construction of a sand-and-oil road, from the Plymouth line towards the new bridge over the canal at Bournedale. The work was pushed with great rapidity, and the road was completed and opened to travel this fall.

Several miles on this route still remain to be built in Plymouth, and a short piece of road in Bourne, before the whole route will be completed and in reasonably good condition.

Boston and the Cape.

There is a good route to the Cape via Middleborough and Brockton.

Last year the Board started to get the old turnpike from Quincy to Bridgewater improved, with the active co-operation of the towns upon the route. This is the most direct route to Middleborough, but had not been selected for the State highway route, — the road between Brockton and West Bridgewater having been built upon instead.

As there is a great deal of automobile travel to and from the Cape points, and the route via East Bridgewater, Whitman and Abington is a country road through sparsely settled districts, and relatively straight and safe, it seemed most desirable that it should be constructed.

Already there were sections of State highway on this route in Quincy, Weymouth and Abington. What was necessary to complete the route was to fill the gaps in Abington, Whitman and East Bridgewater to where the macadam road, built by the town, begins. The matter was taken up with the town authorities, and all three towns agreed to co-operate.

In Abington it was agreed that the commission should build a State highway from the existing State highway south to Abington village, and the town should construct about one-half a mile through North Abington village. The understanding was that the road in Abington should be completed next year, the town building the piece of road where it was thickly settled through the village of Abington, and the balance of the road to the Whitman line being built by the commission. The town took the contract and built both sections of road most expeditiously, so that they were open to travel in the early fall. The Board allotted \$15,000 for its part of the work.

In Whitman the town appropriated \$5,000, and the Board allotted \$10,000. A section of State highway, about one and one-half miles long was constructed, beginning at the East

Bridgewater line and running north towards Abington. The Board expects the town to co-operate again next year, and that the balance of the road in Whitman will be completed.

In East Bridgewater the town appropriated \$1,000, and the Board allotted \$2,000, making \$3,000, to be used in extending the existing macadam road north towards the Whitman line. The work was begun and progressed rapidly. Before it was completed the town decided that it would save money if the work was continued and the road completed to the Whitman line.

The Board agreed to co-operate. The town appropriated another \$1,000, and the Board allotted \$4,390, to complete the macadam road, and also to provide for the use of a refined tar binder on the whole length of road, as it believed that the use of some binder would be necessary to preserve the road, as it would get a very large automobile traffic. This work has been completed, and the road is open to travel.

Bridge over the Wareham River.

The bridge over the East or Swift River in the town of Wareham, at Onset, was entirely inadequate for the present traffic, and a modern and wider bridge was necessary. The town officials requested the Board to give it engineering advice, and to prepare plans and estimates for a new bridge. This was done.

The county commissioners of Plymouth County were petitioned by the town to make the necessary changes in the location of the highway to pay the land damages and a portion of the cost of construction. The permission of the War Department in Washington also had to be secured.

An agreement was made whereby the Board was to let the contract and construct the bridge, and the county of Plymouth was to pay one-quarter of the expense, not exceeding \$10,000, the street railway company, \$5,000, the town of Wareham, \$15,000, and the commission \$10,000. A reinforced concrete bridge, 40 feet in width, with three arches, was to be constructed. The contract was advertised and let, and the work has been going on ever since. The bridge will be completed and opened to travel early next season.

Bourne.

The new highway in the town of Bourne on the south side of Cape Cod canal was in very bad condition, and the town officials requested the Board to furnish specifications for the construction of the whole length of the road.

The existing State highway on the line to the Cape is on the north side of the canal, and the understanding was that the town should construct the road on the south side and the commission should from time to time lay out and build a State highway on the north side.

The town appropriated \$35,000. A contract was advertised and let for the construction of the road on the south side. The contractor pushed the work with great rapidity, so that the whole road is open to travel, and nearly, if not quite, completed.

Sandwich.

The Board has been building on the main Cape line in Sandwich for the past two years. It continued the work this year, allotting \$15,000 for the construction of a sand-and-oil road from the Bourne line to Sandwich village.

The town agreed to co-operate by building the road through the village, and requested the Board to build a short stretch of State highway, continuing the 1912 work on the east side of the village to Liberty Street, building 18 feet in width. This was done, and both roads were completed and opened to travel early in the fall.

Truro.

The State highway in Truro, built many years ago of macadam, was only 10 feet in width, and was unsafe for the large number of automobiles that now go over it on their way to Provincetown. The Board allotted \$7,400, to widen this road with stone, and some \$1,300 for surfacing it with oil and sand. This work has been completed.

The remaining sections of road in Eastham, Wellfleet and Truro have been in process of improvement for several years, and the work was continued this year, a heavy asphaltic oil being combined with sand by the layer and cultivating method, motor vehicle fees being used.

The whole road to Provincetown is now in reasonably good condition, and is suitable for the traffic that uses it. It will, of course, require constant care and attention to maintain it, but it would have required many years and several times as much money to construct a macadam road in this locality. By the use of sand and oil the whole length of road has been made passable during the last four years. Undoubtedly, it will have to be laid out and maintained as a State highway in the near future, as there are many miles to be maintained, and the towns through which it passes are extremely poor.

For the maintenance of the road along the beach in Truro, the Legislature for many years has appropriated \$500 annually. For two years this money has been used by the commission together with money from the motor vehicle fees, and the whole road is now in reasonably good condition.

The Board has also continued building in Mashpee on the route between Falmouth and Barnstable. Eleven thousand dollars were allotted, and a road was constructed of asphaltic oil and sand, mixed hot. About a mile and a half was built, the road being relocated at considerable expense, to improve the corners. Nearly one-half of the distance remaining to be built was completed this year.

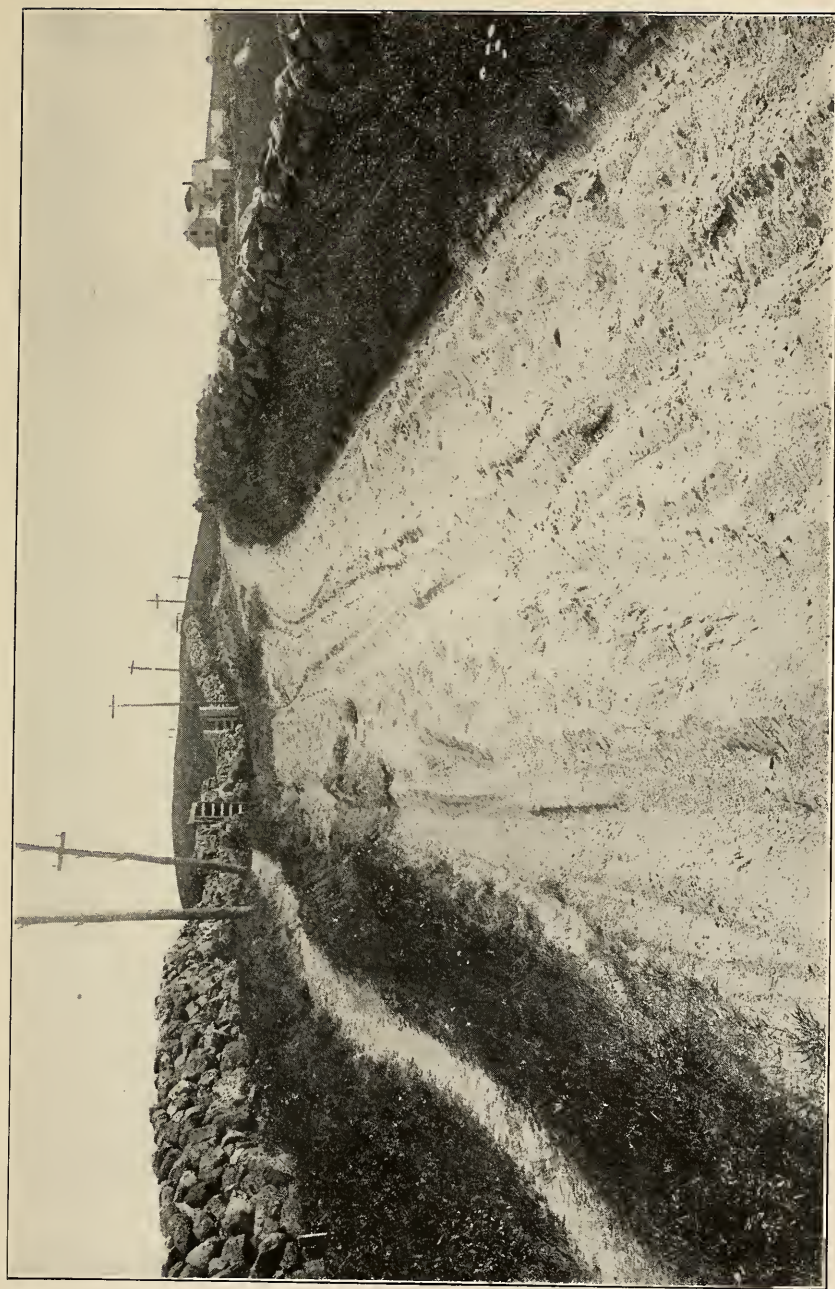
Dukes County.

There has been a great desire on the part of the residents on the island of Marthas Vineyard that the road to Gay Head should be completed and made passable for automobiles. This Indian settlement, with its famous cliffs of colored clay, is a favorite resort.

The Board suggested that, if the road were to be built, it was only fair that the local authorities should put in a considerable portion of the money. The county commissioners of Dukes County agreed to appropriate \$7,500, and secured authority from the Legislature last year to borrow the necessary money.

A survey was made, covering the whole length of over 4 miles.

The commission allotted \$20,000 for use in Chilmark and Gay Head. A contract was let for the construction of the road, a part of it being built of local stone macadam, and on the rest of the road the commission decided to try the experiment of building a sand-and-clay road. These sand-and-clay roads have



Under Contract for Construction in Chilmark.

been built in many parts of the country, particularly in the southern States. They have been found extremely economical to build, and very satisfactory for a reasonable amount of traffic if they are always properly maintained.

Mr. Logan Waller Page, director of the office of public roads, in the department of agriculture at Washington, had suggested that the commission experiment with some roads of this kind, and had agreed to send on an engineer from his office to superintend the construction. His suggestion was adopted and his offer accepted. The engineer is already on the work, directing and supervising the construction. About one-third of the road will probably be built of local stone macadam coated with light oil, and the balance of sand and clay.

The experiment will be watched with great interest, and may prove of great value, because, if a satisfactory road can be built and maintained, in this climate, of sand and clay, the expense of such construction is only a fraction of the cost of building a macadam road, and is probably much less than the cost of the cheaper sand and oil road.

There are many miles of road, not alone on the islands of Marthas Vineyard and Nantucket, but on the Cape and elsewhere, where these materials are available at a reasonable cost, and where the towns can afford to build such a road but have not money enough to build more expensive types. It may prove, however, that this kind of road will not last, and cannot be kept in good condition because of our winter weather. The island with its mild winter is an extremely favorable place to try the experiment.

"SMALL TOWN" ROADS.

Since the passage of the so-called small town act, the commission has allotted about \$750,000 for the improvement of town ways, and the towns in which the work has been done have appropriated about \$483,000, making about \$1,233,000 that has been spent in constructing these town roads. The money has been spent in the improvement of about 354 miles of road in 157 towns. A large mileage of road has also been improved on the through routes in the towns, with funds secured from the motor vehicle fees, over \$145,000 being expended from this source in 1913.

This year the commission has done work in 178 of the towns, using funds available from these two funds, and State highways have been built in 44 cities and towns. Work has, therefore, been going on in 222 of the cities and towns of the Commonwealth. The cities and towns have co-operated in improving the roads this year as never before.

This year when there was \$150,000 available for "small town" work, and \$137,000 available from the motor vehicle fees, the commission did not have money enough to be able to accept all of the propositions which were made by the towns where money had been appropriated to be used in constructing a road conditioned on the Board allotting a like amount of money.

Several such petitions from rich towns had to be refused this year, or there would not have been enough money available for the poorer towns, where an expenditure of a few hundred dollars would be of great benefit. If a few of these large propositions had not been refused or postponed, involving as they did large sums of money, work could not have been done in many of the poor towns in which it was done.

The Board has felt that it was equitable, when there was not money enough to meet all requests, to give preference to the poor towns, and especially to those towns in which no State highway had been located, nor would be in the near future, because they were not on any main through route.

The Board has also, as far as possible, attempted to secure the expenditure of all of this money on the most important roads first, and to see that the worst places in these were first improved, and a continuous improvement made, so that one route is made good, rather than have the money scattered over many small sections of road in different parts of the town, none of them long enough to be of any great value to any one.

The town officials are coming to realize the advantages of this policy and to agree to it, although, naturally, the voters in each section of the town desire the road improved where they live.

In all of this work the commission and its engineers have co-operated with the town in improving sections of road on what might be called secondary lines of travel, though quite a few of them are on main through routes. Many of these roads also

serve as feeders to the State highways, or are on the line to the railroad or nearest market town.

The commission believes that, taking the Commonwealth and the roads as a whole, this is the most valuable work that is done by its engineers.

The town takes the contract and does the work. The Board furnishes the specifications, and its engineers visit the town, find the best material which is available for building the road, stake it out, and supervise the work as it progresses. The town officials are shown how a road should be built, how the materials must be used, and what drainage is necessary. The road when built furnishes an object lesson which all who use it may see, and is a great inducement to the town to continue the good work.

What is very much more important, — the actual doing of the work in a proper way by the town officials themselves, — is educating a large number of men all over the State, teaching them the necessity for adequate drainage, and the use of proper materials in the most efficient and economical manner, and we hope soon to teach them also the absolute necessity of adequate maintenance day by day, and month by month. Too often are well-built roads allowed to go to pieces, and to become full of holes and ruts, in a year or two after their construction, when the timely use of a road drag would increase the life many fold.

MAINTENANCE AND RESURFACING.

With the increasing mileage of State highways, the tremendous increase in automobile traffic, and with the use of heavy motor trucks for long distances to and from the larger cities, the question of maintenance becomes of vital importance. Some State highways are now twenty years old. Their average age is ten years. Naturally, they are rapidly becoming worn out, and are not strong enough to withstand the heavy modern traffic.

Very many miles of road that were formerly built of macadam or gravel, from 12 to 15 feet in width, and from 4 to 6 inches in depth, were entirely adequate to carry from 30 to 60 local vehicles which used them. The corners and curves were entirely safe for horse-drawn vehicles, but are now extremely dangerous

when used daily by hundreds of motor vehicles going at high speed.

What were formerly merely country roads have become main thoroughfares used for intercity and interstate traffic. The roads need widening, the corners and many curves must be improved to make them reasonably safe, and the surface, at least, on main through routes, must be reconstructed, using some permanent form of construction that is capable of withstanding the modern traffic.

This will cost a very large amount of money, probably at least from \$8,000 to \$10,000 a mile, but the work must be planned for ahead, and be done gradually, or, in a few years, many miles of State highway on the heavily traveled routes between our big cities will give out and go to pieces. The work should be planned and begun now, and at least 100 miles a year should be widened and reconstructed, so that at the end of five years 500 miles of road will have been so improved.

It must be remembered that nearly 500 miles of road were built from ten to twenty years ago, and many miles of these roads have not as yet been resurfaced. Of course, they are thin, worn out, and beginning to be broken through by heavy motor trucks. Such trucks are not unusual, and their number is increasing daily.

The engineers estimate that \$3,000,000 is needed for the immediate reconstruction and widening of the worn out and inadequate roads on the many through routes. The commission has asked the Legislature this year to provide some additional money, so that a start can be made on this work, the most important roads and the weakest being improved first.

During the year 1913 the commission spent over \$800,000 in maintaining State highways, \$220,000 of which was provided by direct appropriation by the Legislature, and the balance was secured from the motor vehicle fees fund.

During the year bituminous materials were used in maintaining 501 miles of State highway, and 33 miles were resurfaced.

At the present time bituminous materials have been used, either on the surface or in construction, on 881 miles of State highway, out of the total of 980 miles, leaving only 100 miles

on which it has not been used. Over 2,500,000 gallons of such material have been used.

It should be remembered that the use of such materials was made necessary by the motor vehicle traffic, and that each year the State spends more money in the use of such materials and in the additional cost required to reconstruct the roads, so that they can stand this traffic, than the total amount available from all the motor vehicle fees collected.

CONDITION OF STATE HIGHWAYS.

While the engineers in charge of the different divisions of the State estimate that \$3,000,000 is necessary to reconstruct the State highways on main routes that are now in need of strengthening, it is true that the surface of these highways, as a whole, is in better condition than ever before.

On many miles of road, where there was only money enough to allow the use of a small quantity of light oil last year, merely laying the dust, a second coat of oil has been applied this year which, when covered with stone or sand, has materially improved the condition of the road surface. Such treatment is, of course, merely a temporary expedient and does not add to the thickness or strength of the road. It merely prevents it from being destroyed for a year.

BRIDGES AND CULVERTS.

Most of the bridges built during the year were of reinforced concrete. A detailed statement of them will be found in the chief engineer's report.

Plans were made for several bridges. A three-span concrete arch, 268 feet long, is under construction in Wareham; a 69-foot concrete arch in Blackstone; a two-span concrete beam bridge in Ayer and Shirley, 65 feet long, and a steel bridge of 125-foot span in Revere, are still to be completed. The three-arch concrete bridge over the Deerfield River, 256 feet long, is practically completed.

Designs and estimates were furnished for bridges in Charlton, Framingham, Hadley and Heath.

BRIDGES OVER THE MERRIMACK RIVER AND TAUNTON GREAT RIVER.

These two bridges were put in the charge of the commission by the Legislature of 1912. They both have draws that have to be operated, requiring attendance both day and night. Constant repairs are also necessary, and the engineers estimate that \$20,000 will be required next year to operate them, and make the necessary repairs and replacement.

WORK UNDER SPECIAL ACTS AND UNDER CHAPTER 525, ACTS OF 1910.

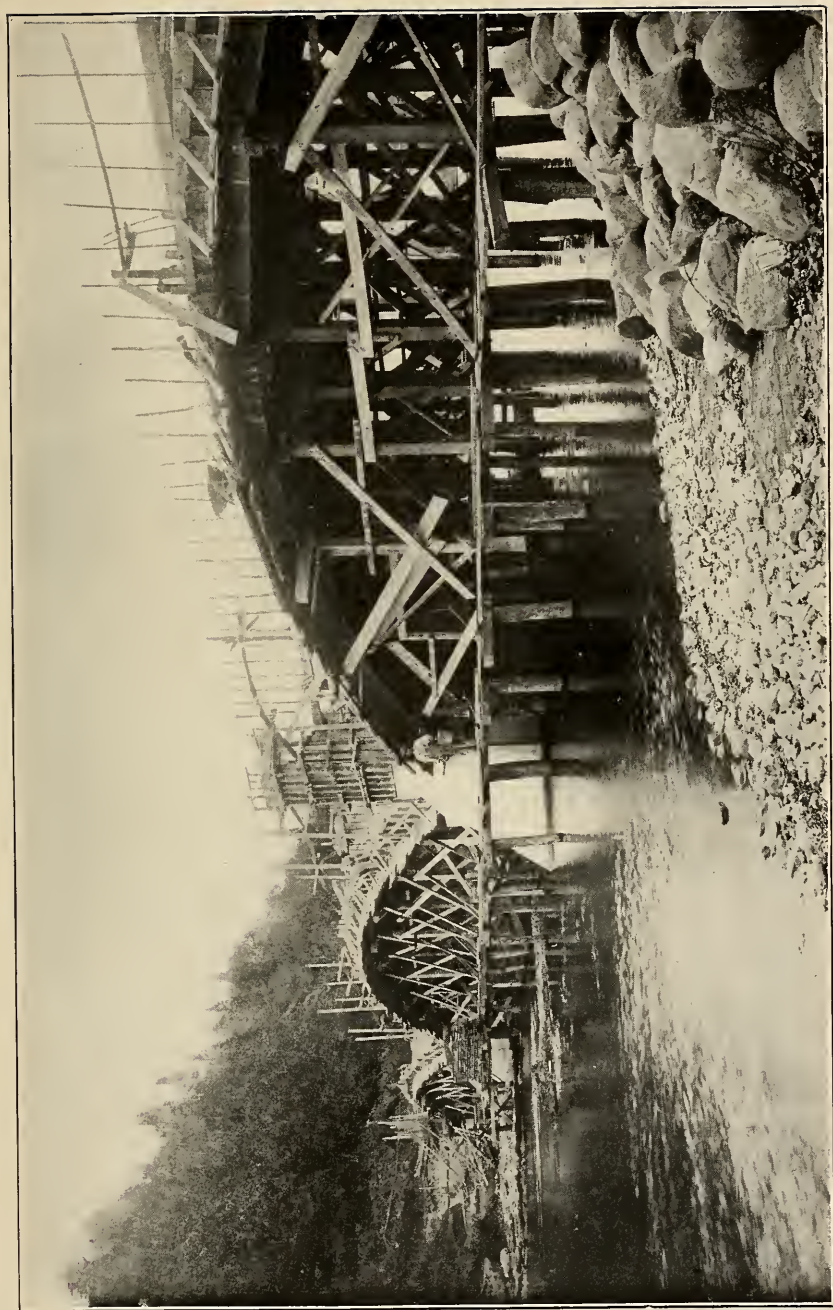
Florida Mountain Road.

The Legislature in 1911 authorized this commission to expend \$75,000 in the construction or improvement of a highway over Hoosac Mountain between the city of North Adams and the valley of the Deerfield River. A thorough investigation was made and many surveys, lines being run upon several different routes to make sure of securing the best grades possible at the least cost.

In 1912 the commission reported to the Legislature that its engineers had discovered an entirely new route for reaching the top of the mountain by crossing the Deerfield River above the town of Charlemont, following, first, the line of Cold River crossing it and following along Manning Brook, and then on in part on a new route, and in part over existing highways, to the summit at Whitcomb Hill, and so on to the North Adams line.

This new route secured not only minimum grades but the highway could be constructed and graded for a fraction of the cost of constructing any highway over existing roads, with equally good grades and equal width. It involved the building of about 12 miles of highway over the new route.

The Legislature in 1912, by chapter 646, made available \$75,000 more money, making \$150,000 in all, and directed the county commissioners of Franklin and Berkshire counties to take all necessary land and make all the necessary layouts. This act was approved on May 25, 1912.



The Charlemont End of the Florida Mountain Road.

The surveys were made and plans completed as rapidly as possible. The commissioners in the two counties co-operated in every way, and acted so expeditiously that the layout was made early in the fall of 1912.

Considerable delay was caused by certain citizens of North Adams, and others, who were interested in having the road built upon substantially the route of the existing highways. This occasioned several hearings, and many conferences on the part of the various commissioners and their engineers.

Estimates were made as accurately as possible of the amount of work involved. The route being some 12 miles in length, and many miles being located in thickly wooded country, and upon the mountain sides, and upon the sides as well as at the foot of high, steep banks, it was manifestly impossible to determine accurately the actual quantities of excavation involved, or the amount of ledges, boulders, and other material which would have to be moved. It would have taken a great deal of time, and cost a great deal of money, to make accurate cross sections and dig enough test pits to determine accurately the quantities and the class of material that was in the cuts.

A contract was advertised early in the fall, and the contract was let to the lowest bidder. The prices were extremely low, the lowest bidder being some \$17,000 below the next competitor.

The work was started and progressed during last winter, and in the spring was rushed with great rapidity by the contractors. At times there were over 300 men at work upon the job.

A reinforced concrete bridge about 250 feet long, with 3 arches, has been nearly completed over the Deerfield River.

The whole length of the road from the old road above Charlemont to the North Adams line has had almost all of the excavation, grading and drainage done, except for a short stretch of road where the commission desires to build over a new route with a bridge over the Fitchburg Railroad.

The commission has been negotiating with the town of Charlemont and the officials of the Boston & Maine Railroad, to see if some equitable agreement could not be made as to the abolition of the existing grade crossing, and the discontinuance of two existing roads that cross the tracks at or near that point. So far, no agreement has been reached, and if one cannot be secured

in the near future, it will be necessary to have a commission appointed by the court, and the grade crossing abolished in the regular way.

This route will be one of the most beautiful in New England, or the country, and, when open to travel, will attract large numbers of tourists not only from Massachusetts but from all over the United States; consequently, it is imperative that there shall be no grade crossing at this point, where there are many trains constantly passing, and waiting to go through the Hoosac Tunnel, which is just beyond.

The commission has let a separate contract for the construction of the concrete bridge over Cold River, and the work has been started. The machinery and materials are mostly on the ground, but work had to be discontinued for the season, both because of the high water and likelihood of freshets, and because of the cold water. As soon as conditions permit, this bridge will be completed, probably by June 1, and by that time the rest of the road will be completed and opened to travel.

The road from the North Adams line, which is nearly at the top of the mountain, down to the existing highways near the foot of the mountain, was also extremely bad, and had also very bad grades and sharp, dangerous turns. As it was manifest that this highway must be constructed if the whole route was to be of much use to the public, the commission took the matter up with the mayor and city government of North Adams, and made an agreement by which this road, also, should be built at the joint expense of the Commonwealth and the city.

Surveys were made as rapidly as possible this summer, and a new route was selected, which made possible a maximum grade of only 7 per cent. This involved leaving the old highway, and making a long loop down the mountain sides.

By agreement, the city of North Adams was to assume and pay all land and grade damages, and also two-sevenths of the cost of construction, not to exceed the sum of \$19,000. A contract was advertised and let, and work has progressed very satisfactorily. It seems probable that this road, also, will be completed and opened to travel early next summer.

It was impossible, with the money available, to do more than construct a well-graded road of proper width, with all the

bridges, culverts and drainage that seemed necessary. The bridges and culverts have been built in a substantial manner; the surfacing has had to be made of the best material available, and will, we believe, with constant shaping and care, make a reasonably good country road in fair condition to travel over during the summer months, which is the only time when it will be much used.

No doubt, upon a road of this kind of construction on the mountain sides, with soil of such a character, more work will be necessary from time to time. Some of the banks and slopes are sure to slide and come down, but as such banks and slopes exist on almost the entire length of the road it seemed better to construct the whole road and then determine by actual experience at what particular points a retaining wall, or other improvement, was necessary, rather than put them in now wherever they might be needed. Moreover, the expense of construction would have far exceeded the money available, and the commission hopes and believes that the present banks and slopes will stand over a large proportion of the entire route, and thereby the Commonwealth will be saved great expense. If the traffic becomes extremely heavy, no doubt, in the future, a better and stronger surface will be required, and should be provided.

If this road is to be properly maintained, it will have to be laid out and maintained as a State highway in the near future, because the towns in which it is located — Charlemont, Savoy and Florida — are but little interested, have many miles of their own to maintain, and the total valuation of all three towns is under \$1,000,000, so they cannot possibly afford to pay the necessary expense.

Additional Money needed for the Construction of the Road over Florida Mountain between the Valley of the Deerfield River and the City of North Adams.

The country through which the highway runs, which the commission was authorized to construct by chapter 646 of the Acts of 1912 and earlier statutes, between the valley of the Deerfield River and the city of North Adams, is rough and mountainous.

During the progress of the work it was discovered that much of the material to be moved was of such a character that the cost

of moving it was very great, also that when it was wet the banks slid and would not stand on the usual slopes. This resulted in the contractor having to excavate much more material than had been estimated, involving a large additional expense, both because of the quantity and because of the kind of material he was required to move. The commission feels, therefore, that more money should be made available to pay for the work done and to be done on this road under the contract.

The commission therefore recommends that additional money be made available, and that it be authorized to expend such sums of money as it deems just and equitable to pay for the work done under the contract, and to complete the work, and to take the same from the money available this year for the construction of State highways.

Dalton-Goshen Road.

The Board has been working many years on this route, which is the main thoroughfare between Northampton and Pittsfield, connecting the Connecticut and Berkshire valleys in the middle of the State.

The town of Windsor started to improve the road towards Dalton early in 1912, doing, as always, most excellent work. While the work was in progress, it was found that \$1,500 more was needed to continue the work to a good place to stop, consequently, the town appropriated \$500, and the Board allotted \$1,000 from this year's money from the "small town" fund.

The Legislatures of 1911 and 1912 each appropriated \$10,000, or a total of \$20,000, to be spent upon this route between the towns of Dalton and Goshen. In 1913 the Legislature appropriated \$10,000 additional.

Late in the fall of 1912 a contract was let for the construction of one of the worst places on this road, between East Windsor and the top of the hill at Windsor. This road was extremely narrow, and very dangerous. Much of the way the material was very bad, and a foundation was necessary. No local stone was available, which was of much value for road building purposes; it was all too soft, and yet it had to be used, because there was nothing else.

The grades were extremely bad, and a very large amount of blasting had to be done to improve them. Also, a very high and



Heavy Sidehill Work partially done in North Adams.

expensive reinforced concrete bridge, with a 24-foot span, costing \$8,600, had to be built over Baldwin Brook. This made the work very expensive.

Some 8,500 feet of road, including the bridge, have been constructed, and to complete this part of the work not only was the whole \$20,000 needed but much more money as well. Believing that this part of the road should be completed, the commission laid it out as a State highway, and allotted \$10,000.

On this same route in Cummington, a bridge had to be rebuilt. The town offered to pay \$1,000 towards the cost, the Board allotted \$3,800 from the special appropriation made in 1913, and a concrete bridge is under construction.

The Board also allotted, for improving the road, \$5,000 from the 1913 special appropriation, and \$3,000 from the motor vehicle fees available on through routes, making \$8,000 available in all.

The town of Goshen, also, does most excellent work, and has co-operated in improving this main route for several years. The town put in \$300, and the Board gave them \$700 from the small town fund, and \$3,000 from the motor vehicle fees fund, and later in the year, as the work was progressing very satisfactorily, it appropriated \$1,200 from the 1913 special appropriation, making \$5,200 available.

This money has been spent for widening, draining and putting in a stone foundation covered with the best material available, so that as great a length of road as possible would be improved and made into a good passable country road.

The soil is of such a character that a stone fill is necessary for almost the entire length of road between the town of Goshen and the top of Windsor Hill, a distance of 16 miles. The country is very rough and hilly, and has a great many ledges, making necessary much expensive blasting. This makes the work so expensive that much of the way it costs about \$2 a running foot, to obtain even a fair country road of reasonable width, with the necessary foundations, culverts and drainage.

The towns are extremely poor and cannot possibly build the road themselves, so that if this main route is to be completed, the Commonwealth will have to pay most of the money not only for its construction but also to maintain it after it is constructed.

Williamsburg.

In Williamsburg on this route to Northampton the town has co-operated with the State most generously for many years, and has done most excellent work in building a good macadam road. This year was no exception. The town appropriated \$1,000 and the Board allotted \$3,200, for the construction of the work on this road. A macadam road, about $\frac{2}{3}$ of a mile in length, has been built.

During the last five years the three towns of Goshen, Cumington and Windsor have expended \$4,330 of their money on this route, the Legislature has appropriated \$30,000, and this Board has allotted from the various funds available \$44,100, making a total of \$78,430.

Many, if not most, of the worst grades, and most dangerous places have been eliminated, and a reasonably good country road has been secured for many miles on the route. A number of miles remain, however, to be built, and, of course, if the traffic increases in the future as it has in the past, a very large amount of money will have to be expended in the near future to provide an adequate surface and to make a road of standard construction.

Pittsfield-Williamstown River Road.

This road runs from Williamstown Center through South Williamstown, New Ashford and Lanesborough to Pittsfield, and is the secondary north and south route in the Berkshire valley. The commission has been working on this route for several years.

In 1910 the State, county and town co-operated in making superficial repairs over $3\frac{1}{2}$ miles of that portion of the road that lies in New Ashford, and did actual work on about 7,900 feet. Not much was done in 1911, but in 1912 the same sort of work was again taken up in both New Ashford and Lanesborough, and about \$2,600 was expended. At about the same time, work was begun on the Williamstown end of the road.

The town and the State expended nearly \$6,000 in building a gravel road from a point near Williamstown village for 4,800 feet towards South Williamstown.

During the winter season of 1912 it became apparent that the gravel was of a nature which required some broken stone for top surfacing if the road was to stand. Consequently, the State and the town expended \$2,000 early this season in putting on a 2-inch stone surface, with a bituminous binder.

The town and the State have also continued the work by expending an additional \$6,000 building a macadam road, out of local stone, over a distance of about 3,800 feet. The town has bought a crusher, and seems inclined to continue the good work.

The State, county and towns of New Ashford and Lanesborough have also gone on in a much more extensive way than before to improve the roads in their towns.

This season \$3,700 was allotted for Lanesborough, and the county gave \$1,000, and the town \$200. Thirty-six hundred dollars was allotted for New Ashford, and the county gave \$1,000, and the town \$200.

This work was done rather late this season, and neither the exact expenditure nor the number of feet improved has yet been reported, but a great start has been made.

The Legislature of 1913, through chapter 128 of the Resolves, made \$10,000 available for this route.

Contracts were prepared and bids were asked for, but all the bids were, in the estimation of this Board, too high. They were therefore rejected, and, as it was then late in the season, it was thought best to defer further action until early in 1914.

The towns of Lanesborough and New Ashford are not wealthy, especially New Ashford, and it is apparent that if this route is to be improved, these towns must have substantial assistance. The commission has been doing all it could for the past few years using money from the several available funds.

The road in many places was very narrow, poorly drained, and extremely dangerous. Most of the work thus far has consisted in widening, draining and remedying the dangerous conditions. Culverts have been built, stone foundations have been placed, ledges have been blasted, and the grades somewhat improved. To secure a good summer road is all that can be hoped for at the present time.

Road between Hinsdale and Chester.

The Legislature of 1913, by chapter 730, appropriated \$10,000 for the construction or improvement of the highway between the towns of Hinsdale and Chester, on the road running in part through the townships of Peru and Middlefield.

The whole distance is nearly 17 miles in length, through a rough and hilly country, where road building is very expensive; consequently, only a portion of the road could be improved with the money available. It therefore seemed wise to spend the money available under this act on that portion of the road that lies between Middlefield village and the foot of the mountain towards Chester. This road is very important to Middlefield, and connects with the through State highway to Springfield at Chester. The existing road was very narrow and dangerous, and had little or no proper drainage.

The portion of the road improved was almost impassable many times in the year, and could only be surmounted by an automobile on low speed, because of the steep grades and "thank you, ma'ams" and the extreme roughness of the road itself.

The commission, therefore, had work done upon 3 miles of road that was extremely bad, widening, reducing the grades as much as possible at any reasonable cost, putting in many stone culverts and stone filling, and making the surface of the best material obtainable. This involved quite a large amount of blasting, to secure sufficient width, and the stone secured was used for filling and embankments.

No good road material was available, so it seemed advisable to make the road passable, rather than to make 10 per cent. of it ideal. Naturally, it will wash more or less, and require constant attention, but the worst places on the whole road between Chester and Middlefield have been greatly improved, and the balance of the road is a fairly good country dirt road.

The town of Middlefield and the commission have also been improving a continuation of this same road in the village of Middlefield, the town appropriating \$200, and the commission having allotted \$850 from the money available in "small towns."

Ware—West Brookfield Road.

Twenty thousand dollars was appropriated by the Legislature, — \$10,000 in 1912 by chapter 706, and \$10,000 in 1913 by chapter 776.

This road is merely a country road of no great importance, even locally. It is about 4 miles in length, and it therefore seemed best to improve the whole length of the road, improving the worst places as much as was possible with the money available. A contract for this work was let early in the fall, and the work has been going on fairly satisfactorily.

It is expected that the money available will be sufficient for the construction of a properly drained highway, with a fair gravel surface. It is not possible, of course, to build a modern highway with the money available, nor does the traffic warrant it, but a good passable country road should be obtained.

Revere Traffic Road.

For many years bills have been presented to the Legislature providing for the laying out and construction of a highway in Revere to connect Lynn with East Boston, starting near the Point of Pines.

Several different routes have been suggested and advocated. In 1910, \$125,000 was made available for the making of surveys, plans, and securing the necessary land and rights of way. Our engineers surveyed several routes, and made a number of estimates of the cost of construction by each route. These plans and estimates have been presented to committees of the Legislature and the town authorities and other interested parties. Many hearings and conferences have been held to consider the desirability of the various routes.

In 1912, \$175,000 additional was made available to be used with the \$125,000 previously appropriated, in securing the land and constructing as much highway as could be built with the money available. This highway was to start at or near the Point of Pines station and continue to Revere Street, a distance of about 11,000 feet.

The commission was authorized to select the route, but the town officials and other interested parties still continued to re-

quest hearings, so the final selection of the route had to be delayed.

Finally, in 1913, the commission determined that while each route had certain advantages, it would be best on the whole to construct the highway back of the railroad locations, and over the marshes. The construction would cost more on this route and the land less.

The commission thought it wise to secure at this time an 80-foot location, instead of the 60-foot location originally authorized, and the Legislature in 1913 authorized the taking of 80 feet in width, and also provided that the \$300,000 already appropriated might be used until the work was completed, or the money expended.

The negotiations with the landowners took a great deal of time, as it seemed wise to take as many options on both routes as possible, so as to ascertain as nearly as possible the probable cost of the land. There was a large amount of land belonging to certain owners that was needed for the highway, and these same owners owned some land adjoining the parkway, but separated from the roadway by a strip of land belonging to the metropolitan park system. They desired to secure this front land.

The Metropolitan Park Commission and its secretary co-operated most cordially and efficiently with our commission. Conferences were held, and finally an agreement was entered into whereby this commission secured the land it needed for the highway, the Metropolitan Park Commission secured certain land which was needed for park purposes, and the landowners obtained the land they needed, all at a price that was reasonable for all parties concerned, and the Commonwealth secured the benefit.

The highway was laid out in July, 1913, and a contract for its construction was advertised and let to the lowest bidder.

The greater portion of the land needed for the highway has been conveyed by the owners, and damages have been settled. A few pieces of land have been taken where no reasonable agreement can yet be made with the owners. The payments for the necessary land and grade damages, moving buildings, etc., will probably amount to about \$60,000.

The work of construction has been started, and is progressing fairly well. The road is to be built at an elevation of $14\frac{1}{2}$ feet above mean low water. The commission's engineers recommended this grade, although they realized it was possible that it might be slightly flooded for a short time once in a good many years by a combination of an extremely high tide with an easterly storm. The road is somewhat higher than the State highway beyond, and than certain portions of the tracks of the Revere Beach & Lynn Railroad. The commission did not consider that the large expense of additional filling would be warranted, for if the road is flooded, it will only be at an interval of many years, and for an hour or so at high tide, and the damage to the road itself will not be great. Part of the filling is being secured by dredging in the Saugus River, and part of it is being brought in on the cars from Winthrop.

An iron girder bridge, on concrete abutments, is to be constructed over the Boston & Maine and the Revere Beach & Lynn Railroad tracks.

The plan calls for one sidewalk, and provision is to be made for a second one if it ever becomes necessary.

The highway is being made 34 feet wide on the top of the slope, and will have 32 feet in width of a tar macadam.

It is certain that the new filling will settle more or less for the first few years, and this form of construction was selected because it was cheaper than some more permanent methods of construction, and it was thought that it would not be so much injured by the settlement, and could be repaired more cheaply.

No doubt, in the future, after several years when the road has settled, or if the traffic makes it necessary, some more permanent pavement can be put down.

The commission's engineers believe that the road will be constructed to Revere Street, and the land damages paid, without exceeding the \$300,000 already appropriated.

Highway between Lawrence and Lowell.

By chapter 647 of the Acts of 1912 this commission was directed to lay out and construct a State highway on the north side of the Merrimack River, in the towns of Dracut and Methuen,

from the Lowell line to Lowell Street in the town of Methuen. Seventy-five thousand dollars was appropriated at that time, and an additional appropriation of \$30,000 was made available by chapter 712 of the Acts of 1913.

By previous statutes the counties of Middlesex and Essex had been required to lay out and construct a highway upon this line, in part over existing highways and in part over a new route, requiring a large amount of grading and construction work.

A contract was let late in 1912 for the construction of this highway, and the work has been going on and has just been completed, and the road opened to travel.

The old road in Dracut had to be widened and reconstructed, culverts and retaining walls had to be built and extended, embankments widened, street railway tracks relocated, and underground drainage provided where it was necessary.

About 1 mile in Dracut and 1 mile in Methuen had been graded by the county commissioners of Middlesex and Essex; the mile in Methuen, constructed by the Essex County commissioners, had been surfaced with gravel, and was in good condition.

The commission realized that as soon as this main highway was opened between two such large cities as Lowell and Lawrence the traffic would be extremely large and heavy, and would make a relatively strong road necessary, as well as a surface that would not be rapidly destroyed by automobile and motor truck traffic. Therefore, the whole length of the road was constructed with bituminous macadam.

This highway connects with a fairly good road in the city of Lowell and with Lowell Street in Methuen, and these furnish a satisfactory highway between Lowell and Lawrence.

This route will be much improved when the city of Lowell reconstructs or resurfaces the street leading to it, and after the county commissioners of Essex County have constructed the new highway continuing along the river in Methuen, which they are authorized to construct by an act of the Legislature of 1912. Upon the completion of the laying out and construction of this way, the Highway Commission is directed by said act to accept

it and lay it out as a State highway. We are informed that a layout has been made, and a contract let for the construction of this highway.

Salisbury Beach Highway.

The commission was authorized, by chapter 454 of the Acts of 1912, to lay out a highway back of Salisbury Beach in the town of Salisbury from the New Hampshire line to Broadway (the main road leading from Salisbury Beach to the town of Salisbury), and was authorized to expend \$15,000 for its construction. This road was nearly 2 miles long, and, consequently, with the money available it was only possible to construct a gravel road. A contract was let for the construction of this road in the fall of 1912, and the road was completed and opened for travel early in 1913.

There was so much motor vehicle travel that the gravel surface soon showed signs of wear, and the commission decided to give it a coat of oil, securing the necessary money from the motor vehicle fees fund. This road is now in very fair condition.

By the terms of the act, the land required and certain rights of way to the beach were to be secured without expense to the Commonwealth, from the owners thereof; or, in other words, any damages caused by the layout and construction were to be assumed or guaranteed by some of the interested parties.

By chapter 715 of the Acts of 1912, a commission, consisting of three members, was to be appointed with power to take land, build highways, etc. This commission was appointed, and proceeded to confer with the Highway Commission, and to take the land and rights of way necessary for the building of the highway, and, thereupon, after the land had been so taken and the rights of way secured by said Salisbury Beach Reservation Commission, the Massachusetts Highway Commission proceeded to lay out and let a contract for the construction of said highway. Some time later the Supreme Court decided that the act establishing the Reservation Commission was unconstitutional, because of some of its provisions.

Under the act requiring the construction of said highway, it was provided that "Said road when so laid out and constructed

shall be a public way in the town of Salisbury." There would seem to be no doubt that some legislation should be passed to determine and make clear the rights of all parties concerned, particularly in regard to the said highway and rights of way connected therewith, street railway locations, land and grade damages, if any, and, possibly, providing also for the assessment of betterments upon the many estates which are so greatly benefited by the construction of said highway.

Province Land Road, Provincetown.

Chapter 88, of the Resolves of 1913, directed the commission to construct a road over the province lands, belonging to the Commonwealth, from the boundary to the sea, a distance of about 2 miles, and appropriated \$5,000 for the purpose.

The road has been constructed of sand and asphaltic oil, and is practically completed. Like all roads of this character, it will need reshaping and patching next year. The road has been constructed 12 feet in width. This was the best that could be done with the amount of money that was available.

Humphrey Street, Swampscott.

Chapter 778 of the Acts of 1913 directed this Board to prepare plans and specifications for the laying out, relocating and construction of Humphrey Street in the town of Swampscott for a uniform width of 70 feet, from Monument Square to the junction of Orient Street. These plans required the approval of the county commissioners of Essex County and the selectmen of the town of Swampscott.

The act provided what particular portion of the necessary work was to be done and paid for by the Commonwealth, the county and the town.

Surveys have been made and a plan prepared showing the location and layout, grades, width of roadway and sidewalks, location of street car tracks, etc., which has been submitted to and approved by both the county commissioners and the selectmen.

Conferences with the different parties interested have been

held on the ground and in the office. The county commissioners have held hearings, and are preparing to make the layout.

The project will be pushed as rapidly as possible, but the details as to materials to be used in the construction, proper location of all rails, pipes, wires, sewers, etc., require great attention, in order that the street when constructed shall serve its purpose as well as possible.

In connection with this work, and to make a satisfactory improvement, it will be necessary to change the lines and grades somewhat, both on Humphrey Street from Monument Square towards or to the Lynn line, and also somewhat beyond its junction with Orient Street. It is probably advisable to change the grade, and possibly the line, of Orient Street for a short distance.

As some doubt has arisen as to the authority of the various officials mentioned in the act to make any such improvements and changes, the commission feels that it would be wise for the Legislature to pass some perfecting amendments to chapter 778, giving this commission, the county commissioners and selectmen any further powers and authority in the premises as seems wise, and authorizing any necessary expenditure.

Lynnfield Street, Lynn.

Chapter 811 of the Acts of 1913 required the county commissioners of Essex County to reconstruct Lynnfield Street in the city of Lynn from the Lynnfield town line to its junction with Great Woods Road, so called.

After said street was so constructed this commission was required to lay it out as a State highway.

The Essex County commissioners requested this commission to suggest specifications for the reconstruction, and our engineers furnished the same.

The road has been constructed with a bituminous macadam top. It is now completed and will be laid out as a State highway as soon as the necessary plans and papers can be prepared. The road appears to have been extremely well built, and of good materials. It is a credit to the county commissioners.

TREES ON STATE HIGHWAYS.

In 1913, as for the past few years, the work of suppressing insect pests on the trees on the State highways east of Worcester has been done under the direction of the State Forester, Mr. F. W. Rane, the field work being under the immediate direction of Mr. George A. Smith, gypsy moth superintendent. In the 37 towns west of that city the work has been done under the direction of the Board's engineers. The results obtained have in general been most satisfactory.

Spraying was required in a number of localities to prevent the ravages of the elm-leaf beetle. This pest has made spraying necessary in many places where it was not required to prevent damage by the gypsy and brown-tail moths.

Mr. Rane's report appears in Appendix C.

During the last ten years 17,242 trees have been planted on the borders of the State highways. This year 250 maples were set out in Barnstable, and the commission continued its policy of planting quick growing trees and hedges to replace guard rails, as in the end this will save a very large amount of money in annual repairs.

TRAFFIC AND COST OF MAINTENANCE.

Many engineers in both France and England have for years past been keeping an accurate account of the actual cost of maintaining certain roads, and of the traffic which actually went over the road. Many of these accounts and experiences are extremely interesting and instructive.

As we stated in our last year's report, a knowledge of the traffic which each particular road will have to carry is absolutely necessary if the best materials and methods of construction are to be used. The same is equally true concerning the methods and materials which should be used to maintain the road after it is built.

The most economical surface to use with certain heavy traffic, including interest on cost and maintenance, may be 6-inch granite blocks on a concrete base, while for very light traffic a gravel road, always properly shaped and maintained, may be entirely adequate.

Factors governing Selection of a Proper Road Surface or Pavement.

Before deciding upon any particular surface of pavement for any special road or street, if we are to decide correctly, it is absolutely necessary that we should know exactly what traffic, and particularly the kind of traffic, the road must carry, and not only the present traffic but the future traffic as well.

We found in Massachusetts that in three years, from 1909 to 1912, the traffic on our State highways had often doubled. Its character also had changed. Some roads had more heavy teaming, — most of them had less, but motor trucks had replaced the teams, carrying actually more tons per day. Automobile traffic had more than doubled, and what were formerly little country roads, with but 20 to 50 teams a day, had now become inter-urban and interstate thoroughfares, carrying from 300 to 700 automobiles a day in the season.

Uniform Traffic Statistics needed.

What we need is some uniform method of taking traffic counts, and some uniform formula that will fairly represent the weight or damage done by the different kinds of traffic, based upon the weight per yard width per year, or per day, so that we can compare results. After a series of years we should then be able to more accurately determine the surface or pavement which would best meet all the necessary requirements.

Traffic statistics have been made for many years in certain places in England and on the continent. The English Road Board has adopted an assumed weight for various vehicles, and many traffic statistics based upon this formula have been made, and are now available in various reports. We could well adopt the same formula, based upon American tons, so that we could compare our results with theirs upon a uniform basis.

English Traffic Formula Weights.

	Assumed Weight of Vehicles (Tons).
Motor vehicles:—	
Runabouts,	1.43
Touring cars,	2.23
Trucks,	6.25
Horse-drawn vehicles:—	
One horse, light, . . . . .	.36
One horse, heavy,	1.12
Two or more horses, light, . . . . .	.54
Two or more horses, heavy,	2.46

The number and class of vehicles having been determined, the traffic per yard width of roadway can be calculated.

Wear, Annual Cost of Maintenance, etc.

Mr. Brodie, city engineer for the city of Liverpool, has made some very accurate studies extending over a period of ten years, covering the weight of traffic per yard width per year, the life of the road, life tonnage per yard width, cost per yard, per ton, etc. His table, which is given herewith, can be studied with great advantage.

Table giving Particulars of Experience obtained in Liverpool with Different Classes of Surface Payment.

PAVEMENT.	Tons per Yard Width per Annum. ¹	Life (Years).	Life Tonnage per Yard Width.	Cost per Square Yard of Sur- face.	Annual Cost, in- cluding Proportion of Capital and Main- tenance per Square Yard.	Ton Miles per Yard Width per Penny.	Cost per Traffic per Mile (Cents).
6-inch sets,	524,000	18	9,432,000	\$2 50	\$0 175	34.0	.058
4-inch sets,	150,000	50 ²	7,500,000	1 87	070	24.0	.080
Hardwood,	162,000	17	2,754,000	3 37	250	7.4	.272
Softwood,	204,000	18	3,672,000	2 12	150	15.5	.128
4-inch pitch macadam,	120,000	11	1,320,000	75	066	20.6	.096
7-inch water-bound mac- adam,	120,000	1	120,000	-	180	7.6	.264
7-inch water-bound mac- adam, tar sprayed,	120,000	2	240,000	25	120	11.4	.180

NOTE.—Tonnes on Road Board basis, except exceptionally heavy traffic which is based on estimated total actual weights.

¹ English ton equals 2,240 pounds.

² Estimated.

You will note that the average cost of maintenance, including capital charges, varies from 7 cents for certain granite sets to 25 cents per square yard per year for certain wood blocks (7 cents for pitch macadam and 4-inch granite sets).

The pitch macadam was practically a trap rock macadam where large stones were used, grouted with a mixture of hot sand and pitch, equal volume, till it flushed, and then smaller stones were rolled in, a surface coat and grits applied on top, and rolled in. One such road is now eleven years old, has not yet been repaired, and has carried a traffic of 120,000 tons per yard width per year.

On the average State highway in Massachusetts, with 15 feet in width of macadam, this would mean 600 to 700 vehicles a day; not, of course, on a real heavy teaming street, but average traffic.

Cost per Ton per Mile.

These figures do not really, however, tell the story of the actual cost, but the cost per ton per mile shows better what duty the road has performed.

The wood block carried less than $7\frac{1}{2}$ tons per yard width for each penny expended, the pitch macadam carried over 20 tons, and 6-inch granite sets on a concrete base carried 34 tons. Water-bound macadam carried only $7\frac{1}{10}$ tons, but if it was tar sprayed, it carried nearly $11\frac{1}{2}$ tons for each penny expended.

Another way of stating the same result is the expenditure for maintenance for each ton transported 1 mile. This cost varied from under .06 of a cent per ton on 6-inch granite sets to about .27 of a cent for hardwood block and water-bound macadam; while tar-sprayed macadam cost .18 of a cent, or only two-thirds as much as water-bound macadam; and pitch macadam cost over .09 of a cent, or about half the cost of the tar-painted macadam.

Any engineer will find himself amply repaid if he makes a careful study of the traffic statistics and costs which are set forth in many of the papers, both French and English, presented at the International Road Congress, and in the reports of the English Road Board.

Note, also, that the *kind* of traffic which has to be carried, makes the most difference of all. Every road surface must be

strong enough not to be crushed, or broken through, by any vehicle that goes over it.

On the Liverpool paved streets, near the docks, 30 tons on four wheels is not an unusual load. Traction engines on iron tires, weighing 12 tons with their load, are common, as are also two or three trailers, weighing, with load, 8 tons each.

Both surface and foundation must be strong enough to bear up every vehicle, without any appreciable rutting or breaking, or the road will be rapidly destroyed.

The cost on different roads in England is given in a table published in connection with the International Road Congress, pamphlet No. 88, report by Messrs. H. T. Wakelam, A. Dryland, Col. R. E. Crompton, C.B., and T. W. A. Hayward.

This table of costs is for water-bound macadam roads, and a very few tar-sprayed roads.

Table showing Weight of Traffic in Tons carried One Mile for One Penny of Maintenance Cost.

COUNTY.	Place.	WEIGHT OF TRAFFIC IN TONS.		Average Cost per Mile per Annum.	Weight in Tons carried One Mile for One Penny.	COST OF MAINTENANCE IN PENCE PER TRAFFIC TON MILE.	
		Per Day.	Per Annum.			Penny.	Cents.
Norfolk, . . .	Weybourne, . . .	39	14,200	41.5	1.4	.710	1.420
Norfolk, . . .	Edgefield, . . .	36	35,000	16.0	9.0	.110	.220
Warwick, . . .	Gaydon Cross Road, . . .	185	67,500	86.0	3.2	.310	.620
Warwick, . . .	Wooten Waven, . . .	239	87,200	127.0	2.9	.340	.680
Warwick, . . .	The Asps, . . .	242	88,300	86.0	4.3	.230	.460
Kent, . . .	Near Charing, ¹ . . .	348	126,700	299.0	1.7	.590	1.180
Norfolk, . . .	Framlingham, . . .	359	121,000	73.5	7.4	.130	.260
Norfolk, . . .	Lyn-Ely, . . .	385	140,500	56.5	10.4	.096	.192
Norfolk, . . .	Diss, . . .	390	142,300	55.0	10.7	.093	.186
Warwick, . . .	Haselor Bar, . . .	451	164,600	127.0	5.4	.180	.360
Norfolk, . . .	East Carleton, . . .	504	184,000	50.5	15.1	.066	.132
Kent, . . .	Road No. 20, . . .	528	192,100	348.0	2.2	.450	.900
Warwick, . . .	Willenhall, . . .	609	222,000	269.0	3.4	.290	.580
Warwick, . . .	Elmdon, . . .	734	268,000	419.0	2.7	.370	.740
Warwick, . . .	Styvechale, . . .	736	268,600	134.0	7.9	.127	.254
Kent, . . .	Road No. 91, ¹ . . .	796	289,800	192.0	6.3	.160	.320
East Sussex, . . .	Roebean, . . .	984	359,000	333.0	4.4	.220	.440
Norfolk, . . .	Diss, . . .	1,057	388,000	218.0	7.3	.130	.260
Kent, . . .	Sidcup, . . .	3,030	1,102,810	2,100.0	2.1	.470	.940
Kent, . . .	Sidcup, ¹ . . .	3,030	1,102,810	1,792.0	2.5	.400	.800
Surrey, . . .	Putney, . . .	5,694	2,078,300	1,032.0	8.4	.120	.240
Surrey, . . .	Putney, ¹ . . .	5,694	2,078,300	604.0	14.3	.070	.140
Average of Norfolk roads.		9,023	3,300,000	2,293.0	6.0	.160	.320
Average of Warwickshire roads.		9,777	3,569,000	3,965.0	3.7	.270	.540

Comparison with Two Massachusetts Roads.

Beverly, ² . . .	2,898	1,058,430	\$3,257	6.50	.185	370
Weston, ² . . .	1,920	699,924	1,993	7.02	.140	.280

¹ Surface tarred.

² Period of fourteen years.

You will note that there are tremendous variations in cost. The maintenance cost on some of these roads is as low as $1\frac{1}{4}/100$ of a cent per ton per mile, and on others as high as $1\frac{2}{5}$ cents. Evidently, much further study is necessary to show not only the reason but the remedy for some excessively high costs.

I have shown two of our State highways merely for the purposes of comparison, and you will note that the cost of water-bound macadam roads is about the average. Where it costs more, it becomes evident from looking over the Liverpool statistics that the pavement is entirely inadequate to carry the loads which are going over it.

These statistics, varying as they do, show the absolute necessity for accurate traffic data as a prerequisite to the selection of a road surface or pavement.

In some of the reports of the French engineers, many costs are given which are of much value for traffic in this country. For instance, the Avenue du Bois de Boulogne in Paris was maintained as water-bound macadam until 1906. It had to be renewed every three years. The annual cost for maintenance was about 39 cents per square yard per year. In September, 1906, it was tarred, and the annual cost of maintenance has fallen to about 25 cents per yard per year, or about two-thirds. It must be remembered that this is a very wide avenue with a tremendous traffic in automobiles and pleasure vehicles, but with little or no teaming.

Asphalts and asphaltic residuums have been but little used in England or France, probably because the tar products are much cheaper, so that it remains for us in this country to keep accurate data, and costs figured on a uniform basis, to determine in each locality what is the best and most economical material that can be used on that particular road, to carry adequately the traffic which will pass over it.

Roads in England and France.

The chairman of this commission was appointed a delegate to represent the Commonwealth at the Third International Road Congress held in London last June. Consequently, he had an opportunity of meeting many of the leading highway

engineers from all over the world, and of securing a great deal of information about their road systems, costs, methods, maintenance, etc. He also inspected over 1,000 miles of highway in France, and a like number of miles in England and Wales. Some of the information obtained may be of value to persons interested in the road problem in this country.

France. — The roads in France are practically divided into the following: —

	Miles.
National routes,	23,800
Departmental routes,	8,100
County roads,	107,300
Rural roads,	232,200
	<hr/>
	371,400

These roads have been built for many years upon standard forms of construction, width, layout, etc., consequently, their main problem is maintenance.

The whole country is divided into eighty-six departments, and all of the county and rural roads within the department are managed by the préfet of that department, and the expenditures appropriated by the council.

Direct charge is in the hands of a centralized body of competent engineers, about half of whom are graduates of the national school.

Each department is divided into four or five political districts, each district being called an arrondissement, and the roads are in charge of a district engineer, who is under the direction of the chief engineer.

Each arrondissement is again divided into districts or cantons, and an assistant road engineer, under the direction of the district road engineer, looks after all the county and rural roads within the canton.

Then comes the final subdivision, where the roads are divided into sections of a few miles long, taken care of by patrolmen. All of these are under civil service, and the men are promoted from time to time according to their ability.

French Roads.

CLASSES.	Total Length (Miles).	AVERAGE WIDTH (YARDS).	
		Ditches included.	Ditches excluded.
Routes nationales,	23,800	20	15½
Routes départementales,	8,100	14	11
Chemins vicinaux: —	115,400		
de grande communication,		10¾	8½
d'intérêt commun,		10	7½
ordinaires,		9	6½
Total,	371,400		

Approximate Cost of Construction.

CLASSES.	Total Expense.	Per Mile.	Per Square Yard, Ditches in- cluded.
Routes nationales,	\$300,000,000	\$12,600	\$0 35
Routes départementales,	63,000,000	7,750	32
Chemins vicinaux: —			
de grande communication,	665,000,000	6,200	33
d'intérêt commun,	178,000,000	3,750	21
ordinaires,	457,000,000	2,470	16
Total,	\$1,663,000,000	—	—

Approximate Cost of Annual Maintenance.

CLASSES.	Total Expense.	Per Mile.	Per Square Yard, Ditches ex- cluded.
Routes nationales,	\$6,500,000	\$270	\$0 0099
Routes départementales,	1,500,000	185	0095
Chemins vicinaux: —			
de grande communication,	16,900,000	157	0105
d'intérêt commun,	6,000,000	126	0095
ordinaires,	14,500,000	78	0068
Total,	\$45,400,000	—	—

Comparative Population and Area.

	Population.	Proportion.	Area (Square Miles).	Proportion.
France,	39,000,000	—	207,000	—
Massachusetts,	3,366,000	⅛	8,255	⅛

The average cost of constructing a mile of road in France, based on the foregoing cost for their 371,400 miles, has been about \$4,500, and the average cost of maintenance over \$122 a mile a year.

It must be remembered, also, that their labor cost now is about half of ours, and that when their roads were built their cost was less than half what it would be now.

To duplicate their road system in Massachusetts there is no question but it would require over \$150,000,000 for the 17,000 miles of road which we have outside the cities.

When one considers that there are over 2,000,000 miles of road in the United States, and that even at the French costs it would mean an expenditure of \$9,000,000,000 to construct them, — which would be about one-seventh of the total assessed value of the property of the United States for the year 1912, — one can readily realize that we shall have the road problem with us for many years to come.

England. — The growth of the English road system, or rather lack of system, is quite interesting historically.

In 1555 a general act was passed for the repair of highways, practically requiring "statute labor." This practice was not superseded by highway rates until 1835. The roads were cared for by the parishes, and a little later several parishes were combined in a highway district.

In 1663 England began to pass "turnpike acts," authorizing the creation of a corporation with trustees, who were to build roads, maintain tollgates and charge tolls.

By 1838 Parliament had passed 3,800 turnpike acts, and created in England and Wales 1,116 turnpike trusts, controlling 22,000 miles of road. They almost all failed, and in the twenty-two years after 1864 the number of turnpike trusts was reduced from 1,048, controlling 20,589 miles of road, to 20 trusts with 700 miles of road.

In 1878 the cost of these main roads which had been dis-turnpiked, was placed upon the counties. In order to even up the expense more or less, the English government made appropriations to aid in the maintenance of these main roads, beginning in 1882 with an appropriation of about \$800,000. In 1888 about \$2,500,000 was appropriated, and now the Road

Board has something over \$6,000,000 annually which can be spent in improving the main roads.

The lack of an adequate road system in England is well shown by the fact that to-day there are some 1,898 different authorities in England and Wales having charge of the roads, and the expenditures to be made upon them. This can be shown better in a table.

England, 1911.

	Miles.	Annual Maintenance.	Authorities, County Engineers.	Yearly Maintenance per Mile.
County councils: —				
Urban main roads,	4,189	\$4,601,790	} 61 {	\$1,100 431
Rural main roads,	23,565	10,177,740		
	27,754	\$14,779,530	—	—
County boroughs,	9,366	\$6,437,380	28	\$685
London authorities,	2,192	3,691,355	2	1,680
	11,558	\$10,128,735	30	—

	Miles.	Annual Maintenance.	Road Authorities.	Yearly Maintenance per Mile.
Urban roads,	11,411	\$4,848,020	} 1,733 {	\$425 555 210
Urban roads,	4,871	2,701,710		
Rural roads,	95,077	11,562,920		
	111,359	\$19,112,650	—	—
Totals,	150,671	\$44,020,915	1,898	\$290

¹ Total expenditures per year (including improvements and interest), \$75,990,000.

Speaking in round numbers, there are 61 county councils who have the care of 27,750 miles of main roads, which cost for yearly maintenance over \$14,000,000. This means 61 experienced engineers.

The London (proper) authorities, under two heads, take care of a little over 2,000 miles of road, and spend over \$3,000,000 yearly.

The twenty-eight county boroughs, which make up metropolitan London, contain 9,366 miles of road, and they spend nearly \$6,500,000 annually.

The other roads, which might be called rural and district roads, and of which there are 111,359 miles, cost annually for

maintenance over \$19,000,000. These roads are in charge of 1,733 different road authorities.

The Road Board and all of the engineers in England are now trying to get some reclassification of their roads, and some provision by which the maintenance of the important roads can be fairly divided between the government, the county and the local authorities, the proportions to be paid by each varying with the importance of the road, so that some system can be secured whereby there will be some uniformity in the practice, and whereby all expenditures will be under the supervision of competent and trained road engineers, road foremen, etc.

The total expenditure on the roads in England and Wales for 1911, including interest charges and improvements for 150,692 miles of road, was nearly \$76,000,000. Of this amount nearly \$19,000,000 was paid out for interest on loans, and \$2,400,000 was paid out for improvements.

The cost of maintenance varied from \$185 a mile a year on the strictly rural roads to \$1,100 a mile a year on the main roads, and \$1,680 a mile a year spent by the London and London county authorities.

Scotland has 24,816 miles of road, and the total cost on them in 1911 was a little over \$6,000,000. On 22,671 miles of these roads the average cost of maintenance was \$160 a mile a year.

The motor vehicle traffic over country roads is several times greater in Massachusetts than it is on country roads situated over 20 miles from London or Paris.

In France, one of the Government engineers in charge of maintenance considered that 40 automobiles a day was heavy motor traffic. In England, one of their county engineers called 50 automobiles a day a large number. In Massachusetts, on State highways, the average number of automobiles a day was 186, and on any main through route 500 was very common, while on some roads there were over 1,000 daily.

Near London and Paris the traffic is very heavy. The water-bound macadam roads do not withstand the motor vehicle traffic any better than they do in this country. Where they still remain, they are usually full of potholes, and are rapidly wearing out and going to pieces.

The French engineers recognize this fact, and it is reported that they have recommended an appropriation of \$50,000,000, to be used in the next eight or ten years in resurfacing with a bituminous macadam some 6,000 or 8,000 miles of their national routes, the surfaces of which are rapidly being destroyed by the motor vehicle traffic.

In England, notwithstanding the large amounts of money they are now spending for yearly maintenance, the engineers all agree that more money is needed to maintain the roads properly with their constantly increasing motor traffic.

The English have now for many years been using some bituminous material, either on the surface or incorporated in the top 3 inches of the road. On 40,000 miles of their roads such a material has been used with most excellent results.

We cannot expect to either build or properly maintain roads in this country, or in this Commonwealth, if we only spend a fraction of the money on each mile of road here that is found necessary abroad.

In several counties in England, where the county has charge of the main roads outside of the villages, \$1,100 a mile a year is spent for maintenance and reconstruction.

A great many traction engines are used on the English roads, weighing about 12 tons loaded, and hauling from one to three trailers, each weighing about 8 tons with their load, and being equipped with iron tires. This traffic has added greatly to the cost of maintaining their roads, as it made a very strong road necessary, and often a foundation as well.

The usual crown on the roads in both England and France is usually not over one-third of an inch to the foot in width, and on bituminous roads it is only one-quarter of an inch. This enables the traffic to spread all over the road, and prevents the ruts which are so common in this country.

It must be remembered that both the English and French roads are already constructed of macadam, and their real problem is maintenance, while in this country very few miles, relatively, have been as yet constructed of anything better than earth or gravel.

The heavy tractors and trucks in England have forced the engineers to materially strengthen their roads, at great ex-

pense. A stone foundation 8 inches to 12 inches deep, with 9 inches of broken stone on top, — the top 3 inches being of bituminous macadam, — has been found necessary on many miles of main road where the traffic was heavy.

To rebuild our State highways in Massachusetts on this standard would cost at least twice as much as was spent for their original construction. To widen the surface to 18 feet, improve the corners and curves, and build the top 3 inches of bituminous macadam, will cost from \$8,000 to \$10,000 a mile.

It is therefore to be hoped that traction engines will not come into use on our roads, as they would certainly destroy them in a short time, if they were not reconstructed very soon.

Constant Patching.

In France and England on the main roads which are used by many motor vehicles, the engineers have found it necessary to use tar or asphalt with the stone, for the purpose of making the filling stay in the holes. On such roads their engineers now recognize that it is useless to fill the holes, or ruts, with loose stone or gravel, as it is immediately thrown out and spread over the road by the motor vehicles.

They also recognize the fact that some binder must be used on the surface, or in the top, to preserve any road that has much motor vehicle traffic.

This commission has recognized both these facts for the past five years, and has been coating the State highways with a bituminous binder as rapidly as possible. It has also been using bitumen in its construction, and for patching holes and ruts. Such materials have already been used on 880 miles of our State highways out of the 980 miles which have been built.

AUTOMOBILE DEPARTMENT.

Fees.

During the year 1913, 62,660 automobiles and 7,127 motor cycles were registered, an increase of over 24+ per cent. in the number of automobiles and over 41 per cent. in the number of motor cycles registered in 1912. In addition to the foregoing

there were 1,330 manufacturers' and dealers' registration certificates issued, including 24 motor cycle dealers.

The amount of fees collected for automobiles was \$616,133, or an average of \$9.83 for each automobile, the average fee collected in 1912 being \$9.82.

For the 1,330 manufacturers' and dealers' registrations \$32,552.50 was collected. The fees collected for the registration of motor cycles amounted to \$13,508, and the fees collected for operators' licenses, examinations and sundries amounted to \$102,015.01.

During the year, 17,009 operators' licenses were issued, and 40,858 operators' licenses were renewed. The number of chauffeurs' licenses issued was 5,233, and the number of chauffeurs' renewals issued was 17,934. There are, therefore, 81,034 persons licensed to operate automobiles in this State. In 1913 the number of licenses issued was 21+ per cent. in excess of those issued in 1912, while the number of automobiles registered increased 24+ per cent.

The total amount collected from registration fees, license fees, sundry receipts, interest, etc., was \$764,208.51, an increase of 24 per cent. over the amount collected in 1912. From this amount had to be paid the cost of number plates, salaries of clerks, investigators, examiners, etc., in the automobile department, as well as many other expenses, rebates, etc.

Eighty per cent. of the balance of the money is by law available for the maintenance and repair of State highways, and 20 per cent. is available for the repair, improvement and construction of roads on through routes in towns, under the provisions of chapter 525 of the Acts of 1910.

For further details relating to registrations, licenses, fees, etc., see Appendix B.

Examinations for Licenses.

The examiners of the commission held 7,255 examinations during the fiscal year of 1913. This was an increase of 266 over the preceding year.

Of the 5,847 persons examined, 5,176 finally succeeded in passing the examinations and 671 failed; while in 1912, 5,936 persons were examined, 347 of whom failed to pass. Almost

all of the failures were on the road test. From the above it will be seen that more examinations were held but fewer people were examined.

Nearly double the number of people failed to pass the examination. The fact that 671 of the persons examined could not pass the examination on road test shows that the applicants have not had as much experience as in former years and that a large number of unfit persons were applying.

Everyone who has looked into the subject has agreed that the examination is entirely fair and practical, and that the road test required is not unduly severe. It consists merely of operating the car under ordinary traffic conditions, though this test is not applied unless it is evident that the operator can operate his car properly where the traffic is not heavy, and so no accident is likely to occur.

Automobile Accidents and Investigations.

The following table shows the accidents in which automobiles have been involved, of which the commission has had any notice through the press, or otherwise, for the fiscal years of 1912 and 1913:—

	<i>Deaths, Injuries, Accidents.</i>	
	1912.	1913.
Total number killed,	142	188
Total number injured,	1,962	2,923
Total number accidents,	2,441	5,027
Total number accidents in daytime,	1,632	3,799
Total number accidents after dark,	809	1,228
Total number accidents on country roads,	495	1,996
Total number accidents on city or town streets,	1,946	3,031

There were 46 more fatal accidents in 1913 than in 1912, an increase of 32 per cent., while during the same period the number of automobiles registered increased 26 per cent.

While the above list shows a tremendous increase in accidents, the Board believes that this increase is due to the law passed by the Legislature last year (chapter 530) requiring every operator to report every accident whenever any person or property was injured. This law has resulted in the commission's receiving over 4,600 letters (an average of about 30 a day), reporting accidents, many of them being of no import-

ance. Each of these trivial accidents, however, appears in the above list.

It should be noted, also, that nearly four times as many accidents are reported as occurring on country roads. This, we believe, is due to the same cause, most of the accidents in the city streets having always been reported by the police or in the newspapers.

Accidents in the Streets of Boston.

In connection with the accidents reported and the apparent tremendous increase in their number caused largely, as we believe, by the law requiring accidents to be reported, it is worth while to see what has happened in Boston, as the results there are a fair criterion for the rest of the State.

The number of automobiles registered has increased 24 per cent. over 1912. The number registered in the four months from December to March, inclusive, has increased from about 20,000 in 1912 to about 34,700 in 1913.

The police commissioner of the city of Boston publishes in his report the record made by that department of the accidents which occur in the streets of Boston. As this record is practically complete and certainly impartial, it is of interest, in connection with the automobile accidents, to consider other accidents as well and the relative traffic.

There were in the streets of Boston during the last tabulated year a total of 82 persons killed and 2,443 injured as a result of various accidents; 46 of the deaths and 1,472 of the injuries were due to traffic of various kinds; 36 deaths and 1,181 injuries were due to other causes, the largest number of which (24 deaths and 687 injuries) being due to falls on the sidewalk, from buildings, etc.

Following are the deaths and injuries caused by accidents due to traffic: —

	1912.		1913.	
	Deaths.	Injuries.	Deaths.	Injuries.
Teams, bicycles, etc.,	14	438	15	513
Street cars,	14	695	9	464
Automobiles,	22	483	22	495

Automobiles were therefore responsible for more deaths than street cars or teams, but caused fewer deaths than the teams and

cars together, and about half as many injuries. There were fewer deaths and fewer injuries caused by automobiles in the streets than were caused by falls of various kinds.

It should be noted that while the number of automobiles in use has increased very greatly, the number of fatal accidents is exactly the same in 1912 and 1913, and the number of injuries caused by them is only 12 more this year than last. This is not a bad showing, and it certainly seems as if in Boston at least the traffic was reasonably well regulated.

The number of fatal accidents caused by teams on the other hand increased from 11 to 15, and the number injured from 438 to 513.

In this connection it should be remembered that motor trucks have, in many instances, replaced several teams and are now very common on the streets, and all their accidents are added to the automobile list.

Court Abstracts.

During the year 1913, 5,107 abstracts of court records were received from the courts, as against 3,670 in 1912. These came from 79 of the 83 courts of the Commonwealth. Only 4 courts failed to send in abstracts in 1913, while in 1912 the number was 8.

The abstracts show that 4,136 persons were convicted of violations of the automobile law; 194 were found not guilty, 289 cases were appealed, 972 complaints were placed on file, and 175 were *not prossed*. In 22 cases the defendants were defaulted and in 31 they were committed to imprisonment. The complaints were as follows:—

For manslaughter,	3
For overspeeding,	1,657
For reckless operating,	151
For operating while intoxicated,	140
For using automobile without authority,	56
For operating in a race,	2
For endangering lives and safety of the public..	67
For failing to stop after causing injury,	40
For improper display or no register number,	81
For operating without a license,	377
For operating without carrying registration certificates,	105
For operating an unregistered motor vehicle,	59

For refusing to stop when signalled by officer,	99
For operating with unlighted lamps,	481
For violations of park rules,	164
For failing to give signal when approaching intersecting way,	1,166
For miscellaneous offences,	729

The abstracts show that \$41,043.50 was imposed as fines, \$973 for violations of the metropolitan park rules, and \$2,786.45 for costs of court. Of course, all of this amount was not, necessarily, collected, as many cases were appealed.

For further details see Appendix B.

Special Regulations.

The commission's report for the year 1912 contains a synopsis of the special regulations then in effect throughout the State.

On May 27, 1913, the selectmen of Topsfield made a special regulation, excluding motor vehicles from West Street in that town. On June 18 the commission gave a public hearing on this regulation, and at the close of the hearing the commission voted to postpone action in the matter until a report shall have been received from the selectmen of Topsfield as to the action to be taken by the selectmen of Boxford with reference to the closing of that portion of the road in question which is located in Boxford. Such a report has not yet been received from the selectmen of Topsfield.

On June 2, 1913, the city council of Newburyport made a special regulation making Winter Street a one-way street for motor vehicles. On August 27 the commission gave a public hearing on this regulation, and at the close of the hearing the city authorities were informed that the commission would not approve the regulation, unless it were amended to include vehicles of all kinds.

On July 14, 1913, the city council of Beverly made a special regulation fixing a maximum speed of 15 miles an hour for motor vehicles on Lothrop Street, between Stone and Hale streets. On August 13 the commission gave a public hearing on this regulation, after which it notified the city authorities that it could not see its way clear to certify that the regulation is consistent with the public interests. The commission believed that the existing law, if properly enforced, would prove to be

entirely adequate to protect the public on that street, the greater portion of it being "thickly settled" and being already subject to the 15-mile limit.

On Sept. 17, 1913, the selectmen of Nantucket made a special regulation, excluding motor vehicles from the following ways in that town, viz.: Broad Street Extension, Broad, North Beach, North Water, South Water, Main, Centre, Union, Orange and Pleasant streets, Cliff Road and Polpis Road; also from the following ways in the village of Siasconset, viz.: Main, New, School, Chapel and Shell Streets, Broadway, McKinley Avenue, Ocean Avenue and Morey Lane. On November 19 the commission gave a public hearing on this regulation, and on November 25 it certified, in writing, that said regulation is consistent with the public interests.

The island of Nantucket itself is a county, and it is all in one township and not contiguous to any other town. It seemed only right, therefore, as no other community was interested, that the citizens of the town should be allowed to make their own regulations and to decide whether or not motor vehicles should be allowed on their streets.

A town meeting was called and was attended by a very large number of voters, and the vote was very nearly unanimous in favor of excluding motor vehicles.

When the present motor vehicle act was passed in 1909, it provided "that no ordinance, by-law, or regulation now in force upon the island of Nantucket relating to the use or operation of motor vehicles shall be affected by the provisions of this act." All the other special regulations, excepting those made by the Metropolitan Park Commission, were made of no effect. This showed that the Legislature recognized the difference between Nantucket and other towns and intended to allow that town to exclude motor vehicles at any rate during the summer months, during which they were excluded by the regulation that then existed.

The Board felt, therefore, that it should approve the regulation covering the balance of the year. To prevent any question as to the legality of such a regulation, it might be advisable, in consideration of the peculiar conditions that exist, for the Legislature to pass an act authorizing the selectmen to exclude

motor vehicles from all the highways on the island if duly authorized by the voters at a town meeting duly called for the purpose.

Automobile Hearings.

These hearings are held either upon complaints or as a result of investigations made by the commission's investigators, or at the request of the operators whose licenses have been suspended or revoked. Such hearings have occupied the entire day on Wednesday of each week and often other days in the week as well. During the past year the commission held 308 such public hearings, while in 1912 there were 289.

In addition to these hearings the commission receives every week a large number of reports of investigations made by its nine investigators. These are read and acted upon by the commissioners. There were 862 such reports made in 1913, as against 595 in 1912.

In 1913 the commission's investigators prosecuted 47 operators in the courts.

During the year 14 operators or chauffeurs were placed on probation by the Board, and were required to report regularly for a certain period, at intervals of a month or so, to some particular officer. Of the persons so placed on probation 12 reported regularly, and 2 had their licenses taken away for failure to keep the terms of their probation.

Suspension and Revocation of Licenses.

The following summary shows the action taken by the commission in the various cases in 1912 and 1913, and the causes of said action:—

Action taken on Formal Complaints after Hearing.

	1912.	1913.
Licenses revoked,	7	17
Licenses suspended,	17	35
Registration certificate suspended,	—	1
Complaints placed on file,	9	11
Complaints dismissed,	6	7
Operators cautioned,	12	12
<hr/>		<hr/>
Total hearings on formal complaints,	51	83

Suspensions and Revocations.

	1912.	1913.
Licenses revoked,	190	198
Licenses suspended,	325	365
Registration certificates suspended or revoked,	6	2
Registration certificates cancelled,	—	2
Dealers' registration certificates suspended,	—	5
Motor cycle registration certificates revoked,	14	19
Motor cycle registration certificates suspended,	11	17
	<hr/>	<hr/>
Total suspensions and revocations,	546	608

Suspensions and revocations resulting from court convictions,	182	247
Suspensions and revocations after hearings on formal complaints,	24	52
Suspensions and revocations after investigation, on which hearings were given in some cases,	340	309
	<hr/>	<hr/>
	546	608

Causes of Suspensions and Revocations.

	1912.	1913.
Reckless operation,	99	120
Operating while under influence of intoxicating liquor,	56	87
Refusing or neglecting to stop after accident,	17	20
Accidents resulting in death,	115	187
Improper operation,	152	101
Three overspeeding convictions,	1	4
Operating automobile without owner's permission,	23	14
Improper person,	48	35
Other offences,	35	40
	<hr/>	<hr/>
	546	608

Deaths.

In 1913 there were 180 accidents in Massachusetts resulting in 188 deaths, and 7 accidents which occurred in other States and in which Massachusetts operators were involved, resulting in 7 deaths, making a total of 187 fatal accidents investigated by the commission, with a total of 195 deaths. In 7 of these cases motor vehicles were only remotely involved, 1 of the deaths being primarily due to heart failure, 1 to burns, 1 to kidney trouble, 1 crushed by an elevator, 2 by jumping from automobiles, and 1 from lockjaw by being injured when cranking an

automobile. They were therefore not considered as accidents in which motor vehicles were directly involved. In 5 cases 2 operators were involved, making a total of 192 operators whose cases were considered. These were disposed of as follows, the figures for 1912 being also given:—

	1912.	1913.
Licenses revoked,	28	29
Motor cycle registration certificates revoked,	—	2
Licenses suspended, and reinstated after investigation and hearing,	64	102
Licenses suspended, final hearings pending,	22	19
Motor cycle registration certificates suspended, and reinstated after investigation and hearing,	—	2
Rights to operate in Massachusetts suspended,	—	6
No action, because operator had no Massachusetts license,	10	9
No action, because operator was unknown,	4	1
No action, because of death of operator,	15	22
	<hr/> 143	<hr/> 192

The number of deaths in 1913 increased 32 per cent. over those in 1912, and in the same period the number of automobiles increased 24 per cent.

One fact which accounts, in part, for the increase in fatal accidents and accidents as well is the open winter and the very much larger number of automobiles being operated in the winter.

In 1911 there were only 11 fatal accidents in the four months of December, January, February and March. In 1913 there were 37 such fatal accidents. The number of automobiles registered in those months had increased from 20,076 in 1911 to 34,699 in 1913, an increase of nearly 75 per cent. The winters have been so open that no doubt a great many more automobiles were actually on the roads.

SUGGESTIONS FOR LEGISLATION.

Construction of State Highways.

There is such a great necessity for the completion of the main through routes as soon as possible, and that they shall be at least made passable, that the commission believes that the present law, prohibiting the construction of more than 10 miles in any one county in any one year, should be done away with.

Now that the commission has \$1,000,000 a year to expend for construction, the above prohibition may often handicap the work, especially as, when it is possible, it seems wise to improve long sections of road on one main through route at one time rather than to construct short pieces of road on many lines, thereby greatly inconveniencing the traveling public. In several places in the Commonwealth there are long stretches of road that have been improved either under special acts, or from the motor vehicle fees fund, or under the small town act, which must be laid out as State highways if they are to be adequately maintained.

Maintenance of State Highways.

During the last few years the traffic on our highways, especially the motor vehicle traffic, has increased so rapidly that it became evident that more and more money would be needed to keep our State highways from being destroyed. Realizing this fact, and believing that the communities which received the benefit of the State highways should contribute equitably, according to their means, towards the cost of their maintenance, the Legislature last year, by chapter 773, provided that the cities and towns should repay up to, but not exceeding, one-half of the expenditures made for that purpose. The amount collectible was graded so that the poorer towns paid only what they already have to pay, to wit, \$50 a mile a year, and the richer towns more in proportion. It was evidently the intention of the Legislature that a certain part, not exceeding one-half of all the money expended, should be collected back for future use.

A large proportion of the money expended on State highways for maintenance is secured from the automobile fees and fines, and by inadvertence the act of last year was not drawn so as to include this money. Consequently, the commission suggests that the act be amended so as to make it clear that all the money expended for maintenance is included in its provisions. Evidently, it makes no difference in the benefit received what particular fund the money comes from, and it seems only just that the cost of maintaining our roads should be equitably distributed, and that the community which receives the special benefit should pay its fair share towards the cost.

Additional Money needed for Florida Mountain Road.

The country through which the highway runs, which the commission was authorized to construct by chapter 646 of the Acts of 1912 and by earlier statutes, between the valley of the Deerfield River and the city of North Adams, is rough and mountainous. The road, some 12 miles in length, runs in part along the valley of Cold River and along Manning Brook, at the foot and on the sides of steep, high slopes, often thickly wooded.

When the contract was let for its construction, the character and amount of material that would be encountered could not therefore be determined accurately in advance. The estimates had to be merely approximations, unless a large expenditure was made in making deep test pits or borings, involving great delay.

During the progress of the work it was discovered that much of the material to be moved was of such a character that the cost of moving it was very great, also that when it was wet the banks slid and would not stand on the usual slopes. This resulted in the contractor having to excavate much more material than had been estimated, involving a large additional expense, both because of the quantity and because of the kind of material he was required to move. The commission feels, therefore, that more money should be made available to pay for the work done and to be done on this road under the contract.

The three towns in which the road is located — Charlemont, Savoy and Florida — are poor, the combined valuation of all three being under \$1,000,000. They are but little interested in this road, have many miles of their own to maintain, and they could not therefore possibly afford to maintain this road. Consequently, as it will need constant care and attention, it must soon be laid out as a State highway.

The commission therefore recommends that additional money be made available, and that it be authorized to expend such sums of money as it deems just and equitable to pay for the work done under the contract, and to complete the work, and to take the same from the money available this year for the construction of State highways.

Renewal Fee for Licenses of Operators of Motor Vehicles.

The present fee required for the yearly renewal of a license to operate motor vehicles is only 50 cents. This is barely sufficient to cover the clerical and office expenses and postage. A renewal fee of \$1 would add nearly \$30,000 a year to the amount available for use in maintaining and improving our highways. It certainly would not burden anyone, and the commission recommends that the fee for the renewal of licenses be increased to such sum as the Legislature deems reasonable.

Fees for Motor Trucks.

Commercial vehicles and motor trucks are rapidly increasing in number, and on many roads they are rapidly replacing heavy teams. On many main roads we already have from 25 to 75 motor trucks every day. They do a great deal of damage to our roads, and very commonly break through the older roads, where there is not much depth of stone and where the road would have been strong enough to carry the traffic except for these heavy trucks. This necessitates expensive repairs, and in many instances reconstruction. It may later make a foundation also necessary.

These vehicles also make it necessary to build stronger and much more expensive roads; and, if they continue to increase, very many miles of our present highways will be destroyed and will have to be reconstructed and made stronger to withstand this traffic, at an average expense of at least \$10,000 a mile, involving a total expenditure of several millions of dollars, in the near future, for such reconstruction and widening of the hardened surface of the road to at least 18 feet.

Traction engines and trailers, if they come into common use here, will also do great damage to the roads.

The present fee of \$5 a year is entirely inadequate, and should be materially increased. In England the tractors are charged \$50 a year, and their road engineers state that the fee is entirely inadequate, and is not sufficient to begin to pay for the additional expense they make necessary for the road maintenance. It seems only fair that they should pay as much or more than automobiles, and the commission recommends such an increased fee.

Identification of Motor Cycles.

There has been a large increase in the number of motor cycles in the last few years. The operators usually run at great speed, often extremely recklessly, and are a great danger to other users of the highway. They have been involved in many accidents in the last few years, several of them fatal accidents. Something should be done to regulate their speed and to stop their reckless operation. The present law merely requires them to carry a small seal, and while there is a number on it, it can only be seen when the machine is stopped. What is needed is some accurate method of identifying the machine and thereby discovering the identity of the operator. Sometimes operators have been able to get away after an accident, and no one has been able to find out whose motor cycle was involved.

In the State of Connecticut and in England motor cycles are required to carry and display two number plates, — one conspicuously displayed in front (being usually fastened to the upright frame below the handlebar), and one behind. Both of the plates are held by frames and clamps made for the purpose. Their use is entirely practical. The number plates are much smaller than those on automobiles, do not inconvenience the operator, can be easily read, and furnish an easy means of identification.

The commission believes that such a means of identification is absolutely necessary to prevent reckless and improper operation, and thereby to conserve the public safety. It therefore recommends the passage of a bill to accomplish that purpose.

Speed of Motor Vehicles.

The commission renews its recommendation of last year that the speed of all motor vehicles be limited to 25 miles an hour as a maximum. It believes this is as fast as any sane and careful operator wants to operate; and believes such a limit is necessary for the public safety, and will decrease the number of accidents.

It believes such a limit will be in the interests of the motorists themselves, as they will then know exactly at what speed they can legally operate on the open road. Under the present law several of our judges hold it to be reckless operation when-

ever what they consider a reasonable speed is exceeded, hence the operator loses his license when perhaps no one was endangered. Such a limit will prevent the road hog, or inconsiderate operator, from forcing all other operators to either speed up or be smothered in dust.

The number of accidents has increased this year, and the commission believes many of them were caused by excessive speed.

For all of these reasons it recommends that a maximum speed of 25 miles an hour be adopted.

Privileges of Nonresident Automobileists.

The States of New York, Connecticut and Vermont, and probably some other States (the number is increasing rapidly), grant full reciprocity to motor cars from other States which give their residents like privileges. Our laws now give a nonresident ten days in a calendar year in which he can operate without registering his car or securing a license. He can then register for the months of July, August and September for one-half the regular fees.

Only 920 nonresidents registered last year. The commission believes that practically all of them were persons who hired houses and resided in this State in the summer.

Believing that Massachusetts should be hospitable, and that we shall lose but little revenue if we grant full touring privileges to nonresidents whenever their home State grants our residents full privileges, we recommend that a "nonresident" be defined as a person who has no regular place of residence or business in this State for a period exceeding one month in any one calendar year; and that all persons who do not have such a place be granted full privileges if their home State grants like privileges to our residents, and grants them privileges exactly equal to those granted our residents in their home State. This should be safeguarded by some provision requiring cars from out of the State to be properly equipped and safely operated, not overloaded, etc.

Perhaps it would be wise to give the commission the right to suspend or revoke the right of any owner to operate, or have operated, a car in this State when in the opinion of the commission its operation endangers the public.

EXPENDITURES.

The following is a summary of the expenditures of the Massachusetts Highway Commission from Dec. 1, 1912, to Nov. 30, 1913:—

CONSTRUCTION EXPENDITURES.

TOWN OR CITY.	Amount.	Totals.
<i>Barnstable County.</i>		
Barnstable,	\$493 90	
Bourne,	8,669 37	
Chatham,	21 30	
Dennis,	70 84	
Mashpee,	15,107 45	
Sandwich,	15,932 21	
Truro,	4,763 63	
Yarmouth (south),	11 50	
		\$45,070 20
<i>Berkshire County.</i>		
Becket,	\$45,524 72	
Cheshire,	7,285 16	
Dalton,	231 70	
Florida,	1,655 69	
Lanesborough,	4,328 76	
Lee,	13,321 78	
North Adams,	27,369 81	
Pittsfield,	17,959 04	
Savoy,	1,655 69	
Sheffield,	18,504 79	
Windsor,	7,264 82	
		145,101 96
<i>Bristol County.</i>		
Berkley,	\$1,245 62	
Dartmouth,	388 71	
Dighton,	1,623 77	
Raynham,	7,167 21	
Rehoboth,	4,818 89	
Seekonk,	10,922 33	
Somerset,	384 71	
Swansea,	5,434 07	
Taunton,	18,029 37	
Westport,	388 71	
		50,403 39
<i>Dukes County.</i>		
Chilmark,	\$1,755 47	
		1,755 47
<i>Amount carried forward,</i> . . . . .	. . .	\$242,331 02

CONSTRUCTION EXPENDITURES — *Continued.*

TOWN OR CITY.	Amount.	Totals.
<i>Amount brought forward,</i> . . .	. . .	\$242,331 02
<i>Essex County.</i>		
Essex,	\$13,773 89	
Haverhill,	817 14	
Middleton,	16,102 83	
Newburyport,	2,610 11	
North Andover,	32,190 40	
Salisbury,	8,755 51	
Saugus,	1,102 98	
		75,352 86
<i>Franklin County.</i>		
Buckland,	\$4,352 90	
Charlemont,	32,902 59	
Deerfield,	577 29	
Erving,	1,201 35	
Gill,	2,607 70	
Northfield,	32,435 73	
Sunderland,	12,632 88	
Whately,	2,819 36	
		89,529 80
<i>Hampden County.</i>		
West Springfield,	\$13,160 33	
Wilbraham,	5,618 42	
		18,778 75
<i>Hampshire County.</i>		
Amherst,	\$11,206 15	
Easthampton,	3,924 34	
Granby,	13,890 54	
Northampton,	38,781 56	
South Hadley,	652 47	
		68,455 06
<i>Middlesex County.</i>		
Acton,	\$24,605 75	
Ashby,	952 94	
Ayer,	9,864 51	
Chelmsford,	84 22	
Concord,	4,968 17	
Holliston,	5,911 86	
Lincoln,	521 31	
Littleton,	20,608 24	
Marlborough,	2,344 43	
Shirley,	4,768 88	
<i>Amount carried forward,</i> . . .	. . .	\$494,447 49

CONSTRUCTION EXPENDITURES — *Concluded.*

TOWN OR CITY.	Amount.	Totals.
<i>Amount brought forward,</i> . . . . .	. . . . .	\$494,447 49
Sudbury,	167 81	
Tyngsborough,	4,025 69	
Westford,	851 63	
Winchester,	2,259 36	
Woburn,	5,359 95	
		87,294 75
<i>Norfolk County.</i>		
Dedham,	\$10,050 64	
Walpole,	6,862 68	
Weymouth,	467 44	
Wrentham,	9,064 75	
		26,445 51
<i>Plymouth County.</i>		
Abington,	\$13,970 49	
Hingham,	307 27	
Lakeville,	563 17	
Middleborough,	1,540 79	
Plymouth,	10,932 90	
Scituate,	21 09	
Wareham,	1,556 50	
Whitman,	470 08	
		29,362 29
<i>Suffolk County.</i>		
Revere,	\$14,720 69	
		14,720 69
<i>Worcester County.</i>		
Ashburnham,	\$1,627 83	
Blackstone,	2,678 82	
Brookfield,	7,390 23	
Charlton,	18,015 94	
Grafton,	18,754 08	
Lunenburg,	19,131 19	
Northborough,	28 00	
Northbridge,	2,404 17	
Oxford,	9,078 15	
Sterling,	11,066 34	
Uxbridge,	3,134 49	
Webster,	4,115 86	
West Boylston,	10,623 52	
		108,048 62
		\$760,319 35

EXPENDITURES UNDER "SMALL TOWN" ACTS.

[Chapter 47, Revised Laws, and Chapter 279, Acts of 1903.]

Alford (four allotments),	\$1,177 13
Ashburnham,	1,000 00
Avon,	400 00
Becket (five allotments),	1,604 50
Berlin (five allotments),	1,647 87
Bolton (three allotments),	1,100 00
Boxborough (three allotments),	825 00
Boxford,	600 00
Boylston (two allotments),	1,700 00
Bridgewater,	576 20
Brimfield (three allotments),	666 67
Buckland (two allotments),	1,200 00
Carlisle (two allotments),	1,000 00
Carver (two allotments),	2,000 00
Chester (five allotments),	1,844 52
Chesterfield (three allotments),	1,622 24
Colrain (three allotments),	1,000 00
Conway (three allotments),	1,000 00
Dana,	400 00
Douglas,	1,500 00
Dracut (two allotments),	3,989 13
Dunstable (three allotments),	1,177 37
East Bridgewater,	1,500 00
East Longmeadow (two allotments),	2,183 75
Egremont (four allotments),	1,486 31
Enfield (three allotments),	2,351 56
Florida (four allotments),	1,550 00
Foxborough,	474 92
Granville (four allotments),	1,750 00
Greenwich,	375 00
Halifax (four allotments),	1,500 00
Hampden (three allotments),	70 36
Hancock (two allotments),	700 00
Hanson (two allotments),	3,605 25
Hardwick (two allotments),	3,082 96
Harvard (two allotments),	2,200 00
Harwich (two allotments),	1,300 00
Hatfield,	1,000 00
Hawley (four allotments),	1,000 00
Heath (four allotments),	550 00

Amount carried forward, \$54,710 74

<i>Amount brought forward,</i>		\$54,710 74
Hinsdale (two allotments),		1,482 27
Holland (two allotments),		10 00
Holbrook,		400 00
Hopkinton,		150 00
Hubbardston (four allotments),		2,800 00
Huntington (two allotments),		1,191 24
Lakeville,		3,251 25
Leverett (four allotments),		750 00
Mendon (four allotments),		1,100 00
Middlefield (three allotments),		169 04
Millbury (two allotments),		2,800 00
Monroe (four allotments),		1,069 05
Monterey (three allotments),		573 17
Mount Washington (three allotments),		778 37
New Ashford (three allotments),		1,503 60
New Braintree (three allotments),		400 00
New Marlborough (nine allotments),		2,431 29
New Salem (six allotments),		3,100 00
Norfolk,		50 00
North Andover (three allotments),		1,499 00
North Reading (two allotments),		2,000 00
Oakham (two allotments),		772 06
Orange (two allotments),		940 67
Otis (two allotments),		145 12
Paxton (four allotments),		1,612 70
Pelham,		1,000 00
Petersham (two allotments),		1,800 00
Plainfield (five allotments),		544 08
Plympton (three allotments),		1,455 00
Prescott (four allotments),		1,198 50
Princeton (two allotments),		1,500 00
Richmond (three allotments),		2,930 88
Rochester (two allotments),		2,000 00
Rowe (three allotments),		1,600 00
Royalston (four allotments),		1,747 65
Russell,		492 90
Sandisfield (six allotments),		1,221 06
Saugus,		1,200 00
Savoy,		650 00
Sheffield (two allotments),		960 80
Sherborn (two allotments),		999 61
Shrewsbury (two allotments),		578 43
<i>Amount carried forward,</i>		\$107,568 48

Amount brought forward,	\$107,568 48
Southampton (four allotments),	1,305 44
Southwick (three allotments),	27 51
Tolland (four allotments),	1,278 40
Townsend (two allotments),	893 05
Tyringham (four allotments),	2,200 00
Wareham (two allotments),	1,737 59
Washington (two allotments),	900 00
Wendell (three allotments),	850 00
West Stockbridge (two allotments),	800 00
Westhampton (four allotments),	1,510 07
Westminster (two allotments),	500 00
Winchendon,	4,328 72
Windsor (two allotments),	1,000 00
Worthington (four allotments),	462 77
Westborough,	1,500 00
West Brookfield,	1,454 44
	<hr/>
	\$128,316 47

REPAIR AND MAINTENANCE EXPENDITURES.

TOWN OR CITY.	Amount.	Totals.
<i>Barnstable County.</i>		
Barnstable,	\$711 32	
Bourne,	496 59	
Brewster,	896 66	
Chatham,	424 73	
Dennis,	656 99	
Eastham,	355 97	
Falmouth,	1,384 62	
Harwich,	313 23	
Mashpee,	16 02	
Orleans,	235 68	
Provincetown,	110 58	
Sandwich,	353 17	
Truro,	304 57	
Wellfleet,	475 84	
Yarmouth (north),	317 04	
Yarmouth (south),	356 47	
		\$7,409 48
<i>Berkshire County.</i>		
Adams,	\$468 90	
Becket,	4,036 15	
Cheshire,	871 99	
Clarksburg,	535 99	
Dalton,	1,243 25	
Great Barrington,	567 50	
Hancock,	3,091 78	
Hinsdale,	159 03	
Lanesborough,	526 63	
Lee,	2,543 32	
Lenox,	6,879 50	
North Adams,	3,651 24	
Pittsfield,	5,045 54	
Richmond,	249 97	
Stockbridge,	1,006 09	
Williamstown,	1,030 12	
Windsor,	238 05	
		32,145 05
<i>Bristol County.</i>		
Acushnet,	\$53 91	
Attleborough,	388 17	
Berkley,	140 27	
Dartmouth,	187 74	
Dighton,	357 54	
Easton,	61 01	
Fairhaven,	104 36	
Freetown,	106 41	
<i>Amounts carried forward,</i>	\$1,399 41	\$39,554 53

REPAIR AND MAINTENANCE EXPENDITURES — *Continued.*

TOWN OR CITY.	Amount.	Totals.
<i>Amounts brought forward,</i>	\$1,399 41	\$39,554 53
Mansfield,	55 83	
North Attleborough,	255 11	
Norton,	322 98	
Raynham,	131 10	
Rehoboth,	352 54	
Seekonk,	253 21	
Somerset,	516 51	
Swansea,	496 39	
Taunton,	285 76	
Westport,	124 68	
		4,193 52
<i>Dukes County.</i>		
Chilmark,	\$200 08	
Edgartown,	19 75	
Oak Bluffs,	10 75	
Tisbury,	55 56	
West Tisbury,	1 00	
		287 14
<i>Essex County.</i>		
Amesbury,	\$485 82	
Andover,	1,397 25	
Beverly,	1,965 62	
Essex,	56 60	
Gloucester,	1,645 40	
Groveland,	411 74	
Hamilton,	648 05	
Haverhill,	2,022 62	
Ipswich,	217 89	
Lawrence,	289 83	
Lynn,	237 90	
Merrimac,	459 73	
Middleton,	41 88	
Methuen,	2,048 44	
Newbury,	441 33	
Newburyport,	678 83	
North Andover,	1,608 84	
Rockport,	525 38	
Rowley,	724 70	
Salem,	911 98	
Salisbury,	790 11	
Saugus,	955 84	
Swampscott,	1,367 50	
Wenham,	1,019 00	
West Newbury,	1,124 89	
		22,077 17
<i>Amount carried forward,</i>		\$66,112 36

REPAIR AND MAINTENANCE EXPENDITURES — *Continued.*

TOWN OR CITY.	Amount.	Totals.
<i>Amount brought forward,</i> . . . . .	.	\$66,112 36
<i>Franklin County.</i>		
Ashfield,	\$209 73	
Bernardston,	299 15	
Buckland,	742 98	
Charlemont,	170 37	
Colrain,	146 43	
Deerfield,	2,486 33	
Erving,	817 60	
Greenfield,	637 08	
Montague,	698 14	
Northfield,	212 34	
Orange,	754 20	
Shelburne,	238 07	
Sunderland,	204 55	
Whately,	820 22	
		8,437 19
<i>Hampden County.</i>		
Agawam,	\$1,780 64	
Brimfield,	600 32	
Chester,	1,973 94	
Chicopee,	3,597 43	
East Longmeadow,	431 07	
Holyoke,	1,129 40	
Monson,	649 21	
Palmer,	3,332 32	
Russell,	3,724 98	
Wales,	602 74	
Westfield,	2,144 83	
West Springfield,	1,877 04	
Wilbraham,	2,289 43	
		24,133 35
<i>Hampshire County.</i>		
Amherst,	\$131 16	
Belchertown,	291 29	
Easthampton,	679 59	
Goshen,	996 88	
Granby,	594 63	
Hadley,	1,051 39	
Hatfield,	1,161 43	
Huntington,	1,221 49	
Northampton,	1,003 16	
Southampton,	71 16	
South Hadley,	2,950 60	
Ware,	2,216 42	
Williamsburg,	443 40	
		12,812 60
<i>Amount carried forward,</i> . . . . .	.	\$111,495 50

REPAIR AND MAINTENANCE EXPENDITURES — *Continued.*

TOWN OR CITY.	Amount.	Totals.
<i>Amount brought forward,</i>		\$111,495 50
<i>Middlesex County.</i>		
Acton,	\$956 74	
Ashby,	674 28	
Ashland,	656 90	
Ayer,	2 23	
Bedford,	191 26	
Billerica,	180 58	
Boxborough,	432 88	
Burlington,	883 40	
Chelmsford,	1,103 56	
Concord,	991 05	
Dracut,	157 95	
Framingham,	1,113 89	
Groton,	145 04	
Holliston,	598 98	
Hudson,	170 20	
Lexington,	819 95	
Lincoln,	427 20	
Littleton,	179 80	
Lowell,	1,906 32	
Marlborough,	3,608 56	
Medford,	83 35	
Melrose,	135 72	
Natick,	2,126 54	
Newton,	91 52	
North Reading,	805 86	
Pepperell,	221 84	
Reading,	1,593 10	
Somerville,	1,187 05	
Stoneham,	830 79	
Sudbury,	3,463 32	
Tewksbury,	1,774 53	
Townsend,	867 20	
Tyngsborough,	1,126 33	
Watertown,	391 16	
Wayland,	578 26	
Westford,	512 71	
Weston,	552 59	
Wilmington,	456 49	
Winchester,	784 62	
Woburn,	890 08	
		\$34,673 93
<i>Amount carried forward,</i>		\$146,169 43

REPAIR AND MAINTENANCE EXPENDITURES — *Continued.*

TOWN OR CITY.	Amount.	Totals.
<i>Amount brought forward,</i> . . . . .	.	\$146,169 43
<i>Nantucket County.</i>		
Nantucket,	\$160 66	160 66
<i>Norfolk County.</i>		
Bellingham,	\$145 81	
Braintree,	159 01	
Canton,	168 15	
Cohasset,	192 08	
Dedham,	5 75	
Dover,	196 89	
Foxborough,	154 09	
Franklin,	699 46	
Holbrook,	108 75	
Milton,	55 48	
Needham,	156 47	
Norfolk,	181 32	
Norwood,	194 84	
Plainville,	140 88	
Quincy,	189 74	
Randolph,	107 48	
Sharon,	50 70	
Stoughton,	382 56	
Walpole,	178 19	
Wellesley,	317 17	
Westwood,	141 09	
Weymouth,	865 21	
Wrentham,	191 91	4,983 03
<i>Plymouth County.</i>		
Abington,	\$242 57	
Bridgewater,	96 92	
Brockton,	243 41	
Duxbury,	369 65	
Hanover,	52 22	
Hingham,	311 18	
Kingston,	199 33	
Lakeville,	298 98	
Marion,	153 91	
Marshfield,	472 49	
Mattapoisett,	222 40	
Middleborough,	736 94	
Pembroke,	26 63	
Plymouth,	721 32	
<i>Amounts carried forward,</i>	\$4,147 95	\$151,313 12

REPAIR AND MAINTENANCE EXPENDITURES — *Continued.*

TOWN OR CITY.	Amount.	Totals.
<i>Amounts brought forward, . . .</i>	\$4,147 95	\$151,313 12
Rochester,	129 96	
Rockland,	194 10	
Scituate,	633 21	
Wareham,	998 13	
West Bridgewater,	135 79	
Whitman,	58 70	
		6,297 84
<i>Suffolk County.</i>		
Boston,	\$1,144 90	
Chelsea,	348 37	
Revere,	1,030 48	
		2,523 75
<i>Worcester County.</i>		
Athol,	\$563 80	
Auburn,	2,515 05	
Ashburnham,	169 33	
Barre,	838 01	
Blackstone,	529 88	
Brookfield,	1,522 98	
Charlton,	1,904 20	
Douglas,	540 65	
Dudley,	1,510 55	
Fitchburg,	679 44	
Gardner,	410 34	
Grafton,	780 52	
Hardwick,	381 86	
Harvard,	403 00	
Holden,	1,686 87	
Lancaster,	626 51	
Leicester,	3,880 77	
Leominster,	765 07	
Lunenburg,	1,853 17	
Milford,	585 21	
Millbury,	682 63	
New Braintree,	68 94	
North Brookfield,	216 14	
Northborough,	2,431 33	
Oxford,	835 95	
Paxton,	1,079 18	
Phillipston,	563 27	
Princeton,	904 03	
Rutland,	536 73	
Shrewsbury,	2,230 97	
Southborough,	731 90	
Southbridge,	366 47	
<i>Amounts carried forward, . . .</i>	\$32,794 75	\$160,134 71

REPAIR AND MAINTENANCE EXPENDITURES — *Concluded.*

TOWN OR CITY.	Amount.	Totals.
<i>Amounts brought forward,</i> . . .	\$32,794 75	\$160,134 71
Spencer,	1,230 87	
Sterling,	1,552 57	
Sturbridge,	837 48	
Sutton,	421 29	
Templeton,	989 13	
Uxbridge,	334 62	
Warren,	798 16	
Webster,	481 01	
Westborough,	761 92	
West Boylston,	513 45	
West Brookfield,	599 75	
Westminster,	824 20	
Worcester,	1,487 87	
		43,627 07
		\$203,761 78

EXPENDITURES FOR REPAIRS OF STATE HIGHWAYS.

Motor Vehicle Fees Fund.

[Under chapter 534, Acts of 1909.]

Abington,	\$940 24
Acton,	431 28
Acushnet,	1,476 24
Adams,	138 53
Agawam,	75 37
Amesbury,	45
Amherst,	432 65
Andover,	11,564 45
Ashby,	801 25
Ashland,	44 46
Athol,	224 00
Auburn,	2,999 85
Attleborough,	7,047 66
Barnstable,	6,962 91
Becket,	961 09
Bedford,	196 12
Belchertown,	199 77

Amount carried forward, \$34,496 32

<i>Amount brought forward,</i>							\$34,496 32
Bellingham,	.	.	.	.	.	.	60 00
Bernardston,	.	.	.	.	.	.	1,172 80
Beverly,	.	.	.	.	.	.	33,207 26
Billerica,	.	.	.	.	.	.	5 00
Blackstone,	.	.	.	.	.	.	40
Boston,	.	.	.	.	.	.	922 42
Bourne,	.	.	.	.	.	.	765 85
Boxborough,	.	.	.	.	.	.	3,164 74
Braintree,	.	.	.	.	.	.	300 76
Brewster,	.	.	.	.	.	.	2,120 07
Bridgewater,	.	.	.	.	.	.	534 99
Brockton,	.	.	.	.	.	.	628 78
Brookfield,	.	.	.	.	.	.	1,160 15
Buckland,	.	.	.	.	.	.	146 70
Burlington,	.	.	.	.	.	.	23 20
Canton,	.	.	.	.	.	.	3,704 14
Charlemont,	.	.	.	.	.	.	278 12
Charlton,	.	.	.	.	.	.	161 60
Chatham,	.	.	.	.	.	.	4,587 26
Chelmsford,	.	.	.	.	.	.	78 34
Chelsea,	.	.	.	.	.	.	1,750 85
Cheshire,	.	.	.	.	.	.	428 17
Chester,	.	.	.	.	.	.	756 54
Chicopee,	.	.	.	.	.	.	21,695 05
Chilmark,	.	.	.	.	.	.	3,088 34
Clarksburg,	.	.	.	.	.	.	185 62
Cohasset,	.	.	.	.	.	.	1,269 46
Colrain,	.	.	.	.	.	.	75 84
Concord,	.	.	.	.	.	.	414 94
Dalton,	.	.	.	.	.	.	3,006 34
Dartmouth,	.	.	.	.	.	.	14,180 03
Dedham,	.	.	.	.	.	.	12 75
Deerfield,	.	.	.	.	.	.	13,193 22
Dennis,	.	.	.	.	.	.	3,139 63
Dighton,	.	.	.	.	.	.	1,220 38
Douglas,	.	.	.	.	.	.	367 25
Dover,	.	.	.	.	.	.	486 28
Dudley,	.	.	.	.	.	.	159 05
Duxbury,	.	.	.	.	.	.	766 75
East Longmeadow,	.	.	.	.	.	.	4 61
Eastham,	.	.	.	.	.	.	2,590 53
							<hr/>
<i>Amount carried forward,</i>							\$156,310 53

<i>Amount brought forward,</i>	.	.	.	\$156,310 53
Easthampton,	.	.	.	302 22
Easton, .	.	.	.	140 19
Edgartown, .	.	.	.	129 85
Erving, .	.	.	.	1,095 08
Essex, .	.	.	.	135 42
Fairhaven, .	.	.	.	378 88
Falmouth, .	.	.	.	3,608 82
Fitchburg, .	.	.	.	2,595 85
Foxborough, .	.	.	.	1,638 09
Framingham, .	.	.	.	21 15
Franklin, .	.	.	.	400 86
Freetown, .	.	.	.	927 33
Gardner, .	.	.	.	11,140 51
Gloucester, .	.	.	.	296 05
Goshen, .	.	.	.	11,922 01
Grafton, .	.	.	.	66 16
Granby, .	.	.	.	60 78
Great Barrington, .	.	.	.	10,708 94
Greenfield, .	.	.	.	1,169 48
Groton, .	.	.	.	539 17
Groveland, .	.	.	.	1 50
Hadley, .	.	.	.	1,039 74
Hamilton, .	.	.	.	1,183 34
Hancock, .	.	.	.	32 50
Hanover, .	.	.	.	645 69
Harvard, .	.	.	.	464 53
Harwich, .	.	.	.	3,682 45
Hatfield, .	.	.	.	516 25
Haverhill, .	.	.	.	38 72
Hingham, .	.	.	.	1,074 41
Hinsdale, .	.	.	.	102 69
Holbrook, .	.	.	.	3,091 69
Holden, .	.	.	.	1,377 60
Holliston, .	.	.	.	21 57
Holyoke, .	.	.	.	19,469 31
Hudson, .	.	.	.	392 12
Huntington, .	.	.	.	62 45
Ipswich, .	.	.	.	1,871 71
Kingston, .	.	.	.	191 45
Lakeville, .	.	.	.	1,422 60
Lancaster, .	.	.	.	291 49

Amount carried forward, . . . \$240,561 18

<i>Amount brought forward,</i>	.	.	.	\$240,561 18
Lanesborough,	.	.	.	422 08
Lawrence,	.	.	.	7 50
Lee,	.	.	.	1,067 35
Leicester,	.	.	.	7,660 87
Lenox,	.	.	.	1,814 49
Leominster,	.	.	.	439 30
Lexington,	.	.	.	688 56
Lincoln,	.	.	.	1,019 68
Littleton,	.	.	.	716 41
Lowell (north),	.	.	.	1 40
Lowell (south),	.	.	.	9 06
Lunenburg,	.	.	.	9,561 62
Lynn,	.	.	.	617 72
Mansfield,	.	.	.	523 33
Marion,	.	.	.	2,620 45
Marlborough,	.	.	.	180 66
Marshfield,	.	.	.	1,733 72
Mashpee,	.	.	.	66 48
Mattapoisett,	.	.	.	1,522 42
Medford,	.	.	.	1,527 65
Melrose,	.	.	.	9 75
Merrimac,	.	.	.	1 50
Methuen,	.	.	.	153 42
Middleborough,	.	.	.	2,410 82
Milford,	.	.	.	2 50
Millbury,	.	.	.	421 75
Milton,	.	.	.	1,059 86
Montague,	.	.	.	292 54
Nantucket,	.	.	.	3,011 54
Natick,	.	.	.	32 21
Needham,	.	.	.	492 79
Newbury,	.	.	.	775 96
Newburyport,	.	.	.	51 28
Newton,	.	.	.	248 16
Norfolk,	.	.	.	342 65
North Adams,	.	.	.	56 15
Northampton,	.	.	.	286 08
North Andover,	.	.	.	578 93
North Attleborough,	.	.	.	9,671 24
Northborough,	.	.	.	173 57
North Brookfield,	.	.	.	28 82
<i>Amount carried forward,</i>				\$292,863 45

<i>Amount brought forward,</i>	.	.	.	\$292,863 45
Northfield,	.	.	.	211 77
North Reading,	.	.	.	190 94
Norton,	.	.	.	1,553 32
Norwood,	.	.	.	2,450 07
Oak Bluffs,	.	.	.	121 09
Orange,	.	.	.	12,439 32
Orleans,	.	.	.	1,274 98
Palmer,	.	.	.	4,595 20
Paxton,	.	.	.	5 00
Pembroke,	.	.	.	701 44
Pepperell,	.	.	.	635 87
Pittsfield,	.	.	.	1,243 42
Plainville,	.	.	.	5,936 96
Plymouth,	.	.	.	934 85
Princeton,	.	.	.	1,533 04
Provincetown,	.	.	.	1,791 98
Quincy,	.	.	.	4,516 01
Randolph,	.	.	.	2,664 55
Raynham,	.	.	.	962 47
Reading,	.	.	.	83 58
Rehoboth,	.	.	.	897 79
Revere (east),	.	.	.	73 17
Revere (west),	.	.	.	63 54
Richmond,	.	.	.	2,581 81
Rochester,	.	.	.	2,367 43
Rockland,	.	.	.	2,629 67
Rockport,	.	.	.	331 28
Rowley,	.	.	.	732 52
Russell,	.	.	.	927 14
Salem,	.	.	.	666 53
Salisbury,	.	.	.	5,714 28
Sandwich,	.	.	.	533 48
Saugus,	.	.	.	96 87
Scituate,	.	.	.	996 02
Seekonk,	.	.	.	9,974 97
Sharon,	.	.	.	265 45
Shelburne,	.	.	.	99 92
Shrewsbury,	.	.	.	2,264 74
Somerset,	.	.	.	8,176 47
Somerville,	.	.	.	766 19
Southborough,	.	.	.	34 00
				<hr/>
<i>Amount carried forward,</i>	.	.	.	\$376,902 58

<i>Amount brought forward,</i>	.	.	.	\$376,902 58
Southbridge,	152	62		
South Hadley,	517	60		
Spencer,	410	82		
Sterling,	799	80		
Stockbridge,	439	05		
Stoneham,	40	76		
Stoughton,	5,181	06		
Sturbridge,	453	46		
Sudbury,	198	20		
Sunderland,	706	24		
Sutton,	802	19		
Swampscott,	375	99		
Swansea,	5,224	79		
Taunton,	1,738	09		
Templeton,	1,170	28		
Tewksbury,	1	40		
Tisbury,	1,323	36		
Townsend,	7,622	78		
Truro,	1,394	83		
Tyngsborough,	222	51		
Uxbridge,	345	33		
Wales,	299	82		
Walpole,	1,220	11		
Ware,	1	10		
Wareham,	11,578	40		
Warren,	2,918	20		
Watertown,	1,378	56		
Wayland,	111	25		
Webster,	791	79		
Wellesley,	10,645	55		
Wellfleet,	1,103	36		
Wenham,	76	42		
Westborough,	53	16		
West Boylston,	9	50		
West Bridgewater,	724	30		
West Brookfield,	221	22		
Westfield,	9,498	05		
Westminster,	7,961	19		
West Newbury,	189	47		
Weston,	20,674	26		
Westport,	2,541	68		
<hr/>				
<i>Amount carried forward,</i>	.	.	.	\$478,021 13

Amount brought forward, . . . \$478,021 13

West Springfield,	25 99
West Tisbury,	2,421 08
Westwood,	659 45
Weymouth,	8,714 43
Whately,	6,952 74
Whitman,	236 80
Wilbraham,	26 73
Williamsburg,	2,381 89
Williamstown,	4 15
Wilmington,	7 90
Winchester,	2,280 09
Windsor,	459 70
Woburn,	20 40
Worcester,	2,481 45
Wrentham,	4,007 28
Yarmouth (north),	624 01
Yarmouth (south),	1,448 31

\$510,773 53

Machinery account:—

1 10-ton steam roller,	\$2,300 00
4 automobiles,	2,911 05
12 tar kettles,	1,135 01
4 street sweepers, with extra brooms,	999 50
8 road scrapers,	870 00
1 water cart,	169 95
2 steel graders,	320 00
1 Monarch oil distributor,	588 00
2 Monarch distributor attachments,	550 00
1 set pressure oiler attachments,	250 00
1 upright boiler mounted on wheels,	355 00
2 steel tanks,	100 00
1 pump,	133 50
12 gravel screens,	63 00
8 sand dryers,	38 48
3 tents,	58 00
12 pouring pots,	48 00
1 Champion blower,	16 65
4 coal screens,	26 00
1 Syracuse plow,	20 00
Analysis of tar and oil,	1,997 60
Rent, light, heat and fuel,	828 35

Amounts carried forward, . . . \$13,778 09 \$510,773 53

<i>Amounts brought forward,</i>				\$13,778 09	\$510,773 53
Salaries and labor,	.	.	.	8,108 32	
Freight and express,	.	.	.	496 88	
Tools and apparatus,	.	.	.	1,918 32	
Materials and repairs,	.	.	.	1,362 85	
Supplies, parts and fittings,	.	.	.	3,656 36	
Auto expense (supplies, repairs and storage),	.	.	.	2,825 66	
Motor cycles (supplies and repairs),	.	.	.	585 19	
Miscellaneous items,	.	.	.	2,834 94	
					35,566 61
Cost of engineering,	.	.	.		48,843 09

Repair and maintenance of town and county
ways (chapter 525, Acts of 1910) : —

Acton,	.	.	.	.	.	.	\$146 82
Amesbury,	.	.	.	.	.	.	2,500 00
Ashburnham,	.	.	.	.	.	.	480 62
Ashfield,	.	.	.	.	.	.	535 00
Athol,	.	.	.	.	.	.	8,217 93
Barre,	.	.	.	.	.	.	502 82
Becket (Lee),	.	.	.	.	.	.	773 56
Bedford,	.	.	.	.	.	.	1,000 00
Bernardston,	.	.	.	.	.	.	2,259 60
Brookfield,	.	.	.	.	.	.	2,382 75
Buckland,	.	.	.	.	.	.	1,331 58
Canton,	.	.	.	.	.	.	1,200 00
Charlemont,	.	.	.	.	.	.	4,000 00
Cheshire,	.	.	.	.	.	.	5,198 62
Clarksburg,	.	.	.	.	.	.	1,450 45
Cummingtown,	.	.	.	.	.	.	3,602 73
Danvers,	.	.	.	.	.	.	1,626 92
Dighton,	.	.	.	.	.	.	272 57
Draeut,	.	.	.	.	.	.	332 39
Easton,	.	.	.	.	.	.	4,000 00
Essex,	.	.	.	.	.	.	300 00
Goshen,	.	.	.	.	.	.	3,656 88
Hatfield,	.	.	.	.	.	.	2,750 00
Huntington,	.	.	.	.	.	.	3,706 33
Ipswich,	.	.	.	.	.	.	463 14
Lanesborough,	2,305 97
Lee,	445 76
Leicester,	2,206 39

<i>Amounts carried forward,</i>	.	.	.	\$57,653 83	\$595,183 23
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<i>Amounts brought forward,</i>							\$57,653 83	\$595,183 23
Littleton,	2,574 84	
Longmeadow,	4,174 58	
Lynnfield,	.	.	.	.	.	.	855 37	
Mansfield,	.	.	.	.	.	.	4,607 00	
Marblehead,	.	.	.	.	.	.	3,950 00	
Medway,	.	.	.	.	.	.	500 00	
Merrimac,	.	.	.	.	.	.	500 00	
Monson,	.	.	.	.	.	.	1,000 00	
Nahant,	.	.	.	.	.	.	4,000 00	
New Ashford,	.	.	.	.	.	.	1,971 59	
Newbury,	.	.	.	.	.	.	1,153 86	
Newburyport Turnpike,	.	.	.	.	.	.	44 50	
North Andover,	.	.	.	.	.	.	299 98	
Norton,	.	.	.	.	.	.	2,698 51	
Norwell,	.	.	.	.	.	.	600 00	
Oxford,	.	.	.	.	.	.	750 00	
Palmer,	.	.	.	.	.	.	562 90	
Peabody,	.	.	.	.	.	.	938 82	
Petersham,	.	.	.	.	.	.	3,898 75	
Peru,	.	.	.	.	.	.	2 00	
Rochester,	.	.	.	.	.	.	1,289 91	
Rowley,	.	.	.	.	.	.	242 37	
Salisbury,	.	.	.	.	.	.	938 35	
Saugus,	.	.	.	.	.	.	2,955 99	
Sheffield,	.	.	.	.	.	.	1,268 80	
Shelburne,	.	.	.	.	.	.	9,172 27	
Somerset,	.	.	.	.	.	.	100 51	
Southampton,	.	.	.	.	.	.	100 00	
South Hadley,	.	.	.	.	.	.	27 00	
Southwick,	.	.	.	.	.	.	3,019 36	
Sudbury,	.	.	.	.	.	.	1,200 00	
Templeton,	.	.	.	.	.	.	1,492 35	
Tewksbury,	.	.	.	.	.	.	1,900 00	
Topsfield,	.	.	.	.	.	.	2,129 26	
Townsend,	.	.	.	.	.	.	76 73	
Truro,	.	.	.	.	.	.	2,998 78	
Upton,	.	.	.	.	.	.	1,497 36	
Uxbridge,	.	.	.	.	.	.	682 41	
Wakefield,	.	.	.	.	.	.	1,000 00	
Wareham,	.	.	.	.	.	.	390 31	
Wayland,	.	.	.	.	.	.	1,838 63	
<i>Amounts carried forward,</i>	.	.	.	.	.	.	\$127,056 92	\$595,183 23

<i>Amounts brought forward,</i>	.	.	.	\$127,056	92	\$595,183	23
Wellfleet,	.	.	.	.	.	3,805	37
Wenham,	.	.	.	.	.	1,000	00
Westminster,	.	.	.	.	.	2,973	16
Wilbraham,	.	.	.	.	.	790	72
Williamsburg,	.	.	.	.	.	4,871	45
Williamstown,	.	.	.	.	.	3,099	01
Wilmington,	.	.	.	.	.	1,000	00
Winchendon,	.	.	.	.	.	1,000	00
Windsor,	.	.	.	.	.	169	83
Worthington,	.	.	.	.	.	500	00
						146,266	46
						\$741,449	69

GENERAL EXPENSES, DEC. 1, 1912, TO NOV. 30, 1913.

[Under Chapter 35, Acts of 1913.]

Salaries of commissioners,	\$10,375	00
Travel of commissioners,	3,693	09
Salaries of clerical assistants and principal assistant engineers,	24,769	82
Rent of offices,	6,259	64
Printing and binding annual report,	1,335	16
Printing,	1,791	11
Office and typewriter supplies,	830	12
Telephone, including tolls,	740	75
Postage, including postal cards and envelopes,	1,463	27
Recording land takings and easements,	103	36
Advertising hearings,	57	07
Travel and expense of chief engineer,	179	80
Rental and repair of typewriters,	98	88
Repairs to steam road rollers,	9,964	56
Miscellaneous items, including express charges, car fares, telegrams and other minor office expenses,	900	14
	<hr/>	
	\$62,561	77
Brightman Street bridge at Fall River:—		
Pay rolls,	\$6,734	04
Electric service and lighting,	1,403	80
Telephone service,	46	62
Repairs,	1,926	19
Tools, supplies,	184	23
Miscellaneous,	118	93
	<hr/>	
	\$10,413	81

Bridge over the Merrimack River at Newburyport:—

Pay rolls,	\$3,029 94
Electric service and lighting,	207 50
Paint and painting,	3,920 18
Telephone service,	43 20
Repairs,	2,741 50
Tools, supplies,	270 01
Miscellaneous,	282 32
	<hr/>
	\$10,494 65

MOTOR VEHICLE FEES FUND.

[Under Chapter 534, Acts of 1909.]

Automobile Department.

Salaries of clerks and clerical assistants,	\$49,917 73
Rent of offices,	3,447 87
Number plates, motor cycle seals and speed signs,	32,408 28
Printing,	8,786 83
Postage,	6,783 90
Typewriters purchased and rented,	804 66
Office supplies,	1,499 56
Cartage and storage,	1,036 80
Miscellaneous items, including express charges, car fares, telegrams and other minor office expenses,	401 44
	<hr/>
	\$105,087 07

Examiner's Department.

Salaries of inspectors and examiners,	\$14,197 70
Salaries of clerks and stenographers,	2,860 68
Mileage books,	1,350 00
Traveling expenses,	2,954 98
Printing,	442 09
Postage, including stamped envelopes,	314 00
Rent,	779 16
Newspaper clippings,	213 70
Miscellaneous items,	86 45
Office supplies,	135 00
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	\$23,333 76

Rebates of automobile fees,	\$6,531 25
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EXPENSES CONNECTED WITH TELEPHONE AND TELEGRAPH SUPERVISION.

[Under chapter 42, Acts of 1913.]

Salaries of commissioners,	\$2,625 00
Salaries of clerical assistants,	1,581 66
Printing,	835 32
Miscellaneous items,	114 90
	<hr/>
	\$5,156 88

[Under Chapter 632, Acts of 1908, and Chapter 78, Resolves of 1909.]

Expenses in connection with an inventory and appraisal of the property of the New England Telephone and Telegraph Company,	\$4,363 36
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MISCELLANEOUS EXPENDITURES.

[Under Chapter 677, Acts of 1911, and Chapter 646, Acts of 1912.]

Expenditures for the construction of a highway over Hoosac Mountain, between the city of North Adams and the valley of the Deerfield River,	\$123,662 29
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[Under Chapter 697, Acts of 1912, and Chapter 639, Acts of 1913.]

Expenditures for the laying out and construction of a so- called traffic road in the town of Revere, extending southerly from the Point of Pines,	\$74,679 67
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[Under Chapter 647, Acts of 1912, and Chapter 713, Acts of 1913.]

Expenditures for the improvement of a highway along the northerly bank of the Merrimac River in the towns of Dracut and Methuen,	\$74,064 87
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[Under Chapter 627, Acts of 1912, and Chapter 731, Acts of 1913.]

Expenditures for the improvement of a highway between the towns of Dalton and Goshen in the counties of Berkshire and Hampshire,	\$26,907 05
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[Under Chapter 746, Acts of 1911, and Chapter 454, Acts of 1912.]

Expenditures for the construction of a highway from the New Hampshire line to Broadway in the town of Salisbury,	\$14,400 76
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[Under Chapter 730, Acts of 1913.]

Expenditures for the improvement of a highway leading from the town of Hinsdale to the town of Chester through the town of Middlefield,	\$9,085 00
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[Under Chapter 703, Acts of 1912.]

Expenditures for the construction or improvement of a highway between the towns of Ware and West Brookfield,	\$6,281 28
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[Under Chapter 678, Acts of 1911, and Chapter 677, Acts of 1912.]

Expenditures for the construction of a highway between Shelburne Falls and Green River bridge in the town of Greenfield,	\$6,047 37
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[Under Chapter 88, Resolves of 1913.]

Expenditures for repairing the road on the Province Lands in the town of Provincetown,	\$2,311 07
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[Under Chapters 416 and 744, Acts of 1911, and Chapter 35, Acts of 1913.]

Expenditures for the improvement of Beach Point Road in the town of Truro,	\$499 50
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[Under Chapter 128, Resolves of 1913.]

Expenditures for the construction of the River Road, so-called, between the town of Williamstown and the city of Pittsfield,	\$477 05
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[Under Chapter 57, Resolves of 1913.]

Expenditures for an investigation relative to the laying out as a State highway of North Beacon Street in the city of Boston and the town of Watertown,	\$460 22
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[Under Chapter 778, Acts of 1913.]

Expenditures for the laying out and construction of Humphrey Street in the town of Swampscott,	\$409 49
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SUMMARY OF EXPENDITURES.

For construction,	\$760,319 35
For construction under "small town" acts,	128,316 47
For road repair and maintenance, from revenue,	203,761 78
For road repair and maintenance (motor vehicle fees fund),	595,183 23
For road construction under chapter 525, Acts of 1910,	146,266 46
For general expense under chapter 35, Acts of 1913,	83,470 23
For expenditures connected with automobile registration,	105,087 07
For expenses of examiners and investigators,	23,333 76

<i>Amount carried forward,</i>	<i>\$2,045,738 35</i>
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<i>Amount brought forward,</i>	\$2,045,738 35
For rebates of automobile fees, under chapter 534, Acts of 1909,	6,531 25
For telephone and telegraph supervision, under chapter 42, Acts of 1913,	5,156 88
For expenditures under chapter 632, Acts of 1908, and chapter 78, Resolves of 1909,	4,363 36
For expenditures under chapter 677, Acts of 1911, and chapter 646, Acts of 1912,	123,662 29
For expenditures under chapter 697, Acts of 1912, and chapter 639, Acts of 1913,	74,679 67
For expenditures under chapter 647, Acts of 1912, and chapter 713, Acts of 1913,	74,064 87
For expenditures under chapter 627, Acts of 1912, and chapter 731, Acts of 1913,	26,907 05
For expenditures under chapter 746, Acts of 1911, and chapter 454, Acts of 1912,	14,400 76
For expenditures under chapter 730, Acts of 1913,	9,085 00
For expenditures under chapter 703, Acts of 1912,	6,281 28
For expenditures under chapter 678, Acts of 1911, and chapter 677, Acts of 1912,	6,047 37
For expenditures under chapter 88, Resolves of 1913,	2,311 07
For expenditures under chapters 416 and 744, Acts of 1911, and chapter 35, Acts of 1913,	499 50
For expenditures under chapter 128, Resolves of 1913,	477 05
For expenditures under chapter 57, Resolves of 1913,	460 22
For expenditures under chapter 778, Acts of 1913,	409 49
	<hr/>
	\$2,401,075 46

WM. D. SOHIER,
F. D. KEMP,
JAMES W. SYNAN,

Massachusetts Highway Commission.

APPENDIX A.

REPORT OF THE CHIEF ENGINEER.

DEC. 1, 1913.

To the Massachusetts Highway Commission.

GENTLEMEN:— In addition to the information previously furnished to your Board for use in your annual report, I respectfully submit the following details:—

SURVEYS, ESTIMATES AND DESIGNS.

During the year preliminary surveys, plans and estimates were made on contemplated State highways in 46 towns, covering an aggregate distance of 58.66 miles. Lines and grades for construction work on State highways have been made in 59 towns, covering an aggregate distance of 66.53 miles, some of this work having been done on roads upon which construction was commenced in 1912. Final surveys and measurements were made on completed State highways in 33 towns, covering an aggregate distance of 31.61 miles. On "small town" work, so called, preliminary surveys, including plans and profiles, were made in 115 towns, covering an aggregate distance of 75.98 miles. In addition to the above, surveys have been made in 13 towns of roads to be constructed by towns, covering an aggregate distance of 13 miles.

Layout plans have been made of roads in 64 towns, covering an aggregate distance of 60.06 miles. Plans to accompany decrees for street railway locations on State highways have been made in 31 towns.

BRIDGES.

The following is a list of bridges built or contracted for during the year:—

Ayer-Shirley — over Nashua River; 2-span concrete beam, total length, 65 feet.

Blackstone — over "the trench;" concrete arch, 69-foot span.

Brookfield — over Dunn Brook; concrete beam, 21-foot span.

Charlton — over Cady Brook; concrete beam, 11½-foot span (for town).

Charlton — over Cady Brook; concrete beam, 12-foot span.

Charlemont — over Trout Brook; concrete beam, 10-foot span.

Concord — over Nashober Brook; concrete beam, 17-foot span.

Cummington — over Swift River; concrete arch, 46-foot span.

Florida — over Little Cold River; concrete beam, 15-foot span.

Granby — over Forge Pond; concrete beam, 15-foot span.

Hadley — over Mill River; concrete arch, 25-foot span (for town).

Lee — over Green Water Pond Brook; concrete slab, 13-foot span.

North Reading — over Martin's Brook; concrete beam, 20-foot span.

Pittsfield — over Housatonic River; concrete beam, 20½-foot span.

Pittsfield — over Housatonic River; concrete beam, 29½-foot span.

Revere — over railroad; steel truss, 130-foot span.

Shirley — over Nashua River; concrete slab, 12-foot span.

Shirley — over Nashua River; concrete slab, 12-foot span.

Sunderland — over Dry Brook; concrete beam, 13½-foot span.

Tyngsborough — over Mill Pond; concrete beam, 12-foot span.

Wareham — over Swift River; 3-span concrete arch, total length, 268 feet.

Warren — over Quaboag River; concrete beam, 21-foot span.

West Boylston — over Still River; concrete slab, 9-foot span.

Windsor — over Westfield River; concrete beam, 20½-foot span.

Designs and estimates have also been made for contemplated bridges as follows:—

Charlemont — over Boston & Maine Railroad; concrete arch, 88½-foot span.

Charlton — over Cady Brook; concrete beam, 18-foot span.

Cheshire — over Hoosac River; 2-span concrete beam, total length, 42 feet.

Becket — over Walker Brook; concrete beam, 32-foot span.

Becket — over Walker Brook; concrete beam, 32-foot span.

Becket — over Walker Brook; concrete beam, 16-foot span.

Florida — over Little Cold River; concrete arch, 12-foot span.

Framingham — over Sudbury River; concrete beam, 2 spans, total length, 68½ feet.

Heath — over Hager's Brook; concrete beam, 16-foot span.

STATE HIGHWAYS.

Construction has been completed of 20.16 miles on contracts that were pending at the beginning of the year, and construction has also been completed of 29.10 miles of roads on which work was

commenced during the present year, making a total of 49.26 miles of construction completed during the year. Up to the present time 980.37 miles have been laid out as State highway.

Construction has been commenced but not completed on 31.28 miles of roads on layouts of this year in 30 towns.

Of the above roads completed this year, 9.53 miles were of water-bound macadam; 4.17 miles were of gravel; 4.75 miles were of sand bound with oil; 22.24 miles were of bituminous macadam, that is, macadam with bituminous binder incorporated in the top course; 3.23 miles were of water-bound macadam with an oil surface applied; 2.90 miles were of gravel with the top surface bound with bituminous binder; 2.01 miles were of cement concrete; and 0.44 mile of granite block on concrete base.

Bituminous material has been used in the maintenance of State highways during the present year on 501.25 miles and, in construction, on 33.12 miles, and there are at present 881.22 miles of State highways on which bituminous material has been used either in construction or maintenance.

Accompanying this report will be found tables as follows: Appendix A, page 121, is a table showing costs of construction of State highways separated in order that comparisons may be made between the costs of different classes of work in different portions of the State, under varying conditions. Appendix E, page 132, is a table showing highways laid out or contracted for, and gives lengths and construction expenditures. Appendix F, page 146, is a table showing towns and cities in which State highways have been completed during the year. Appendix G, page 150, is a table showing contract prices. Appendix I, page 155, gives the amounts expended for repairs and maintenance.

“SMALL TOWN” WORK.

Under the provisions of the “small town” act, roads were constructed during the year in 94 towns, and contracts were made but not completed in 30 towns. Appendix K, page 163, shows the lengths, types and location of these roads built during the year and the allotments made therefor.

PERMITS.

Eight hundred and twenty-five permits have been issued during the year for opening or occupying State highways for various purposes.

ADVICE TO TOWNS.

During the year engineering advice, so far as record has been kept, has been given to officials in 51 towns and cities. The advice requested related to all classes of highway work, from the maintenance of dirt roads to the construction of block pavements and highway bridges. While accurate cost of the work on which advice has been given could not be obtained, the approximate cost of such work is \$350,000.

Respectfully submitted,

A. W. DEAN,
Chief Engineer.

TABLE SHOWING APPROXIMATE COSTS OF GRADING AND DRAINAGE, SEPARATED FROM SURFACE COSTS, ON ROADS COMPLETED IN 1913.

TOWN.	Type of Surface.	BASIS OF CALCULATION.		Drainage, Culverts and Bridges, Total Cost.	Grading and Foundation, Cost per Mile.	COST OF SURFACE.	
		Miles.	Square Yards.			Per Mile.	Per Square Yard.
Acton, 1912,	Macadam, 5-inch, local stone, bituminous binder,	1.13	11,933	\$733	\$4,880	\$8,182	\$0 77
Acton, 1912,	Macadam, 5-inch, local stone bituminous binder, . . . . .	.64	5,632	1,405	2,554	7,272	82
Annerstedt, 1912,	Macadam, 5-inch, trap rock, . . . . .	.79	6,952	1,099	4,390	5,950	67
Becket, 1912,	Macadam, 5-inch, local stone,	1.39	12,232	1,883	9,246	4,502	51
Charlton, 1912,	Macadam, 3½-inch, local stone, . . . . .	.87	7,656	3,388	3,855	3,301	37
Charlton, 1912,	Macadam, 4-inch, local stone,	1.24	10,912	741	4,130	3,811	43
Charlton, 1912,	Macadam, 4-inch, local stone,	1.64	14,432	2,465	2,742	4,919	55
Lanesborough, 1912,	Macadam, 6-inch, local stone, bituminous binder, . . . . .	.33	2,094	45	5,611	7,900	89
Littleton-Ayer, 1912,	Macadam, 3½-inch, trap rock, bituminous binder, . . . . .	.39	3,712	774	3,698	5,940	67
Mashpee, 1912,	Gravel, 4-inch, macadam, 2-inch, local stone, bituminous binder,	1.35	12,617	305	1,857	5,044	58
Middleton, 1912,	Sand and oil, 3-inch, mixed, . . . . .	.61	6,442	357	6,572	3,414	88
Northfield-Gill, 1912,	Gravel, 6-inch, local stone, concrete bridge,	2.16	19,008	2,843	5,445	2,500	23
Northfield, 1912,	Sand and oil, 3-inch, local stone, bituminous binder,	1.24	10,912	6,000	8,941	5,480	62
Plymouth, 1912,	Macadam, 5-inch, local stone, bituminous binder,	1.58	14,767	-1	-1	5,171	55
Seekonk,	Macadam, 5-inch, local stone, concrete bridge, . . . . .	.76	6,688	62	4,971	7,384	83
Sterling, 1912,	Macadam, 4½-inch, local stone, bituminous binder,	1.41	12,408	320	2,491	5,640	64
Sunderland,	Macadam, 5-inch, bituminous binder, . . . . .	.98	8,624	1,609	1,916	6,700	77
Westford, 1912,	Gravel, 6-inch, trap rock, concrete bridge,	1.86	16,368	537	1,930	1,496	17
West Springfield, 1912,	Gravel, 5-inch, . . . . .	.74	7,814	520	7,671	7,305	69
Wilbraham,	Macadam, 4-inch, trap rock, bituminous binder, . . . . .	.25	2,200	2,398	2,200	7,079	80

1 Grading and drainage completed in 1912.

APPENDIX B.

RELATING TO THE WORK OF THE AUTOMOBILE DEPARTMENT.

Statement showing the Number of Registration Certificates and Licenses to operate issued during the Fiscal Year 1912, also the Fees received for the same, together with the Fees for Examinations, for Copies of Certificates of Registration and Licenses, etc., and Fines for Violation of the Automobile Law.

Certificates of registration:—

Automobiles,	62,660	\$616,133 00
Motor cycles,	7,127	13,508 00
Manufacturers and dealers,	1,330	39,333 00

Licenses to operate:—

Operators,	17,009 at \$2 00	34,018 00
Chauffeurs,	5,233 at 2 00	10,466 00
Operators' renewals,	40,858 at 50	20,429 00
Chauffeurs' renewals,	17,934 at 50	8,967 00

Examinations,	7,288 at 2 00	14,576 00
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Copies of certificates and licenses furnished,

.	2,946 at 50	1,473 00
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Number plates and seals,		1,089 25
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Miscellaneous receipts, including interest on deposits,		4,161 26
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Amount received at the office of the commission,		\$764,153 51
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Court fines received by the Treasurer and Receiver-General,		39,043 00
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Total receipts for the year,		\$803,196 51
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REPORT OF THE EXAMINING AND INVESTIGATING DEPARTMENT.

F. I. BIELER, *Secretary, Massachusetts Highway Commission.*

DEAR SIR:—I respectfully submit the following as the seventh annual report of the examining and investigating department for the period from Dec. 1, 1912, to Dec. 1, 1913.

EXAMINATIONS.

Examinations have been conducted in 9 cities of the Commonwealth besides Boston, and by request a few examinations have been conducted in other cities, these examinations being given for

the reason that the applicant demonstrated on some type of motor vehicle which could not readily be taken to the regular place of examination.

In comparison with the statistics of last year, the following features may be noted:—

	1912.	1913.
Total number of examinations (chauffeurs),	7,045	7,255
Total number of examinations (operators),	-1	56
Total number of examinations (chauffeurs reported unfit),	1,204	2,046
Total number of examinations (operators reported unfit),	-1	19
Total number of chauffeurs examined,	5,936	5,802
Total number of chauffeurs passed,	5,589	5,139
Total number of chauffeurs failed to receive licenses,	347	663
Total number of operators examined,	-1	45
Total number of operators passed,	-1	37
Total number of operators failed to receive licenses,	-1	8

¹ Entered under chauffeurs.

From these statistics it will be seen that there has been a decrease of 89 in the number of persons examined, and the examinations conducted were 266 more this year than last. The large increase in failures indicates that applicants are appearing for examination not so well prepared as they were formerly. This year 413 less persons finally passed the examination. On the basis of percentage, 11.47 per cent. finally failed, as against 5.84 per cent. for 1912. Of the total number of persons examined, 45 were applicants for operators' licenses and were given 56 examinations. Of this number, 37 finally passed and 8 failed.

INVESTIGATIONS AND PROSECUTIONS.

A comparison of cases investigated in 1912 and 1913 is given below:—

	1912.	1913.
Total number reports received from investigators, itemized as follows:		
Accidents (nonfatal),	324	259
Accidents (fatal),	144	183
Accidents (brief reports),	-	103
General reputation,	40	21
Miscellaneous,	87	90
Garages, dealers,	-	206
Total,	595	862
Garages inspected,	-	288
Prosecutions,	42	47
Total amount of fines,	\$1,602	\$2,015

Of the 195 deaths, 188 occurred in Massachusetts, 3 in Rhode Island, 1 in New Hampshire, 1 in Vermont, 1 in Maine and 1 in Connecticut. These last 7 deaths were investigated for the reason that the operators were residents of this State. The total number of deaths resulted from 187 accidents, a few accidents having occurred in which more than one person was killed. Of the 188 deaths which occurred in Massachusetts, 1 was in part the result of burns, 1 of kidney trouble, 1 caused by being crushed by an elevator, 2 were due to jumping from moving automobiles, and 1 to lockjaw contracted from injuries received while cranking a motor. These last deaths may be regarded as having been only indirectly connected with the operation of automobiles.

Of the 183 reports received this year from investigators concerning death cases, 5 were of fatal accidents which occurred during the fiscal year 1912, and 9 were accidents which occurred previous to Dec. 1, 1913, but which were not reported until after Dec. 1, 1913.

One June 16, 1913, Charles E. Lathrop, Harry C. Ellis and Robert E. Bowman were appointed inspectors and examiners. On July 1, 1913, Inspector Ernest L. Blish asked for a leave of absence for one year, which was granted.

About the first of June, the State was divided into seven districts, each district being put in charge of an investigator, with instructions to investigate all serious accidents occurring in his district, as well as to report on such violations of the automobile law as he saw fit. In addition, we have one inspector unassigned to any particular district, his duty being to investigate cases of a more or less difficult nature.

Since the 1st of June, we have endeavored to investigate the garages and dealers, ascertaining if they were complying with the automobile law. Furthermore, the department has investigated 103 accidents on which brief reports were filed, the cases not being considered serious enough to call to the attention of the Board.

We have received 12,104 newspaper clippings referring to automobile accidents and prosecutions in which motor vehicles were involved. A great many of these clippings were duplicates. As in past years, a daily record has been kept showing all automobile accidents in a carefully analyzed tabulation. Besides a daily record, a monthly compilation is also made.

Since chapter 530 of the Acts of 1913 went into effect, the department has received 4,638 letters from operators of automobiles who have been involved in accidents. This is an average of nearly 30 letters per day.

DEATHS, INJURIES, ACCIDENTS.

A comparison of the figures for the year 1912 with those of 1913 is given below:—

Deaths and Injuries.

	KILLED.		INJURED.	
	1912.	1913.	1912.	1913.
Occupants of automobiles,	37	47	703	783
Pedestrians,	92	111	877	1,476
Motor cycle riders,	5	13	72	221
Bicycle riders,	4	8	97	190
Occupants of carriages,	3	9	190	229
Street car passengers,	—	—	23	24
Equestrians,	1	—	—	—
Total,	142	188	1,962	2,923

Accidents.

	1912.	1913.
Automobiles v. pedestrians,	970	1,567
Automobiles v. automobiles,	288	1,161
Automobiles v. carriages, etc.,	284	746
Automobiles v. motor cycles,	74	243
Automobiles v. bicycles,	101	252
Automobiles v. trolley cars,	182	365
Automobiles v. pole, post, etc.,	530	662
Automobiles v. trains,	12	31
Total,	2,441	5,027

	1912.	1913.
Accidents in daytime,	1,632	3,799
Accidents after dark,	809	1,228
Accidents on country roads,	495	1,996
Accidents on city or town streets,	1,946	3,031

PROBATION.

During the year 1913, 14 chauffeurs or operators, who had been placed on probation by the Board, were required to report either at this office or to the several inspectors in their districts. Of this number, 12 fully complied with the terms of their probation, and 2, for not properly keeping such terms, had their licenses either suspended or revoked.

COURT ABSTRACTS.

During the year 1913, 5,107 abstracts of court records have been received, as against 3,670 received in 1912. These have come from 79 courts in this Commonwealth. As in previous years, we still experience considerable difficulty in obtaining these abstracts.

*Comparison of Analysis of Abstracts of Court Records for the Fiscal Year
1912 with the Fiscal Year 1913.*

	1912.	1913.
Number of courts that have forwarded abstracts,	75	79
Total number of abstracts received,	3,670	5,107
Persons guilty of operating unlawfully,	2,853	4,136
Persons not guilty of operating unlawfully,	176	194
Cases appealed to a higher court,	353	289
Complaints placed on file,	731	972
Complaints <i>not</i> pressed,	107	175
Defendants defaulted,	13	22
Persons committed to imprisonment,	16	31
Complaints brought:—		
For manslaughter,	2	3
For murder,	1	0
For overspeeding,	759	1,657
For reckless operating,	169	151
For operating in a race,	2	2
For operating while intoxicated,	113	140
For using automobile without authority,	49	56
For endangering lives and safety of the public,	40	67
For failing to stop after causing injury,	25	40
For improper display or no register number,	83	81
For operating without a license,	274	377
For operating without carrying registration certificate,	67	105
For operating an unregistered motor vehicle,	46	59
For refusing to stop when signalled by officer,	67	99
For operating with unlighted lamps,	447	481
For violations of park rules,	212	164
For failing to give signal when approaching intersecting way,	1,026	1,166
For miscellaneous offences,	358	729

Fines, etc., as shown by Court Abstracts.

	1912.	1913.
For violating State statutes,	\$31,272 00	\$41,043 50
For violating metropolitan park rules,	1,941 00	973 00
For cost of court,	2,465 82	2,786 45
Total,	\$35,678 82	\$44,802 95

Respectfully submitted,

F. L. AUSTIN,

Chief Examiner and Inspector.

APPENDIX C.

RELATING TO THE CARE OF SHADE TREES ON STATE HIGHWAYS.

REPORT OF MR. F. W. RANE, STATE FORESTER.

JAN. 7, 1914.

Massachusetts Highway Commission, 15 Ashburton Place, Boston, Mass.

GENTLEMEN:—The department has continued throughout the year to carry on the moth work and spraying for elm leaf beetle on the State highways throughout the moth-infested sections of the State. As heretofore, your department has met the expense of the work. There has been no charge to the Highway Commission for our general supervision of this work.

There is real need for more work being done than the appropriation allowed us. In fact, our real trouble in this co-operative work is to keep from overrunning our allotment from your commission. We would recommend an expenditure of \$12,000, to carry on this work for the coming year. This would allow for the pruning of trees, in addition, where it is necessary. The following table contains the expenditures of each town for the past year.

Respectfully submitted,

F. W. RANE,
State Forester.

HIGHWAY WORK DONE IN THE FOLLOWING TOWNS IN 1913 PAID FOR
BY THE HIGHWAY COMMISSION.

Acton,	\$151 01	Lakeville,	\$46 27
Amesbury,	29 34	Lancaster,	52 18
Andover,	80 01	Leominster,	7 81
Ashburnham,	39 50	Lexington,	137 46
Ashby,	49 13	Lincoln,	61 63
Ashland,	65 32	Littleton,	74 78
Attleborough,	59 62	Lowell,	41 04
Barnstable,	405 00	Lunenburg,	42 09
Barre,	19 00	Marlborough,	241 11
Bedford,	67 29	Marshfield,	28 50
Bellingham,	13 10	Melrose,	31 80
Beverly,	154 48	Merrimac,	29 65
Billerica,	65 00	Methuen,	86 68
Boxborough,	122 75	Middleborough	29 03
Brewster,	30 00	Millbury,	10 62
Bridgewater,	31 40	Milton,	1 98
Burlington,	228 20	Natick,	48 07
Chelmsford,	98 43	Needham,	68 14
Cohasset,	33 68	Newbury,	75 35
Concord,	197 02	Newburyport,	36 59
Dennis,	6 00	North Andover,	148 65
Dighton,	93 77	North Attleborough,	64 05
Dover,	30 94	North Reading,	37 75
Dracut,	63 32	Northborough,	128 10
Duxbury,	16 00	Norton,	43 75
Falmouth,	70 55	Norwood,	67 60
Fitchburg,	77 39	Pepperell,	64 75
Foxborough,	95 00	Quincy,	10 00
Framingham,	108 17	Reading,	155 00
Franklin,	51 50	Rockland,	88 75
Grafton,	43 85	Rowley,	103 12
Groton,	39 78	Salisbury,	84 84
Groveland,	48 61	Sandwich,	21 00
Hamilton,	46 45	Scituate,	134 90
Haverhill,	153 53	Shrewsbury,	26 10
Harvard,	44 82	Somerset,	110 37
Hingham,	74 10	Southborough,	59 15
Holbrook,	10 50	Sterling,	87 08
Holliston,	10 00	Stoneham,	116 44
Hudson,	42 63	Sudbury,	255 20
Ipswich,	48 00	Sutton,	8 00

Swampscott, . . .	\$5 00	Westborough, . . .	\$29 70
Swansea, . . .	127 75	Westford, . . .	120 00
Taunton, . . .	35 79	Westminster, . . .	7 50
Templeton, . . .	7 50	Weston, . . .	103 00
Tewksbury, . . .	105 18	Westwood, . . .	16 50
Townsend, . . .	274 17	Weymouth, . . .	125 81
Tyngsborough, . . .	134 75	Wilmington, . . .	75 12
Wayland, . . .	98 73	Winchester, . . .	98 95
Wellfleet, . . .	30 00	Woburn, . . .	193 67
Wenham, . . .	94 75	Worcester, . . .	15 68
West Boylston, . . .	39 38		
West Bridgewater, . . .	13 68		
West Newbury, . . .	97 88		
			<hr/>
			\$7,930 06

APPENDIX D.

REPORT OF THE CHEMIST.

Massachusetts Highway Commission.

GENTLEMEN:— During the year 1913 the laboratory work of this department was much greater than during any previous year since the examination of materials was begun, 452 samples of bituminous materials having been examined up to November 30. A summary of this work shows that at least 37 materials having different trade names have been forwarded to the laboratory, these including 10 samples of asphaltoil A; 29 samples of Bermudez; 41 samples of standard macadam binder A; 13 samples of standard road oil No. 5; 13 samples of standard road oil, 40 per cent.; 11 samples of Texaco road oil, 45 per cent.; 9 samples of Texaco special macadam binder; 17 samples of tarvia A; 25 samples of tarvia B; 154 samples of tarvia X; besides many samples of material with other trade names, such as asphaltoil B, standard macadam binder B, Texaco liquid asphalt No. 1, tarite, etc.

The analyses made show as well as possible, in the present state of asphalt and tar chemistry, the quality and desirability of each material used for road work.

It will be noticed from a study of the table that certain binders with the same trade name differ materially in composition, and this is especially noticeable with some of the grades of "tarvia," "tarine" and "tarite" used. The binder known as "tarvia X," for example, used during the year had a great variation in viscosity, free carbon and portions coming off at different temperatures during distillation, etc., and showed a tendency to become less valuable as the season progressed. The gulf oils, such as asphaltoil A and B, the natural asphalt Bermudez, and the refined tars known as tarvia A and B, had about the same average consistency as in 1912. Standard macadam binder A made during the present year of Mexican oils, as stated by dealers, was of a greater density and had a higher specific gravity than the 1912 product sold under this

name. Standard macadam binder B was of a higher specific gravity, but somewhat softer than in 1912.

I would again suggest that greater uniformity in the composition of these various materials be insisted upon or materials be bought, if possible, under specifications, in order that only those conforming to the requirements of the commission be forwarded for use.

Respectfully submitted,

H. W. CLARK,

Chemist.

DEC. 31, 1913.

Athol.	1895-6,	Orange line,	Easterly,	1.61	40,040	73
Athol.	1902-3,	Phillipston line,	Northwesterly,	1.49		
Attleborough,	1900-1-3,	North Attleborough line,	Southwesterly,	2.65	20,722	11
Attleborough,	1909,	Norton line,	Northwesterly,	7.74	70,089	83
Auburn,	1895-6-7-8-9-1901-3-4,	Worcester line to Oxford line,	Southwesterly,	5.28	9,804	51
Ayer,	1912,	Littleton line to Littleton line,	Southwesterly,	1.13		
Ayer,	1913,	Shirley line,	Southwesterly,	1.86		
Barnstable (north),	1909,	Yarmouth line,	Westerly,	1.91		
Barnstable (north),	1899-1902-7-10-11,	Sandwich line,	Easterly,	5.49	50,580	70
Barnstable (south), ²	1897-1901,	Yarmouth line,	Westerly,	2.26		
Barnstable (west),	1904,	Marston Mills,	Southwesterly,	1.48	29,337	12
Barre,	1897-9,	Ware River to Barre Common,	Northwesterly,	2.89		
Becket,	1902-4-5-6-8,	Chester line,	Westerly,	5.56		
Becket,	1910,	Point on Becket-Lee Road,	Northwesterly line,	.59	152,243	58
Becket,	1912,	West Becket cemetery,	Lee line,	1.39		
Becket,	1913,	Northwesterly end of 1912 section,	Northwesterly,	1.36		
Bedford,	1897-1902,	Lexington line,	Southwesterly,	1.07	22,145	82
Bedford,	1903-6,	Carlisle bridge,	Southwesterly,	.58	22,534	14
Belchertown,	1900-1-2-7-8,	Near depot,	Westerly,	2.35	22,866	35
Bellingham,	1902-5,	Blackstone line,	Northwesterly,	.55		
Bellingham,	1904-5-6,	Franklin line to Mendon line,	Westerly,	2.63	6,388	43
Berkley,	1906,	Lakeville line,	Northwesterly,	.77		
Berkley,	1913,	Northwesterly end of 1906 section,	Taunton line,	.49	11,476	78
Beverly,	1895-7-8,	Falls River to Gill line,	Easterly,	2.70	33,163	42
Beverly,	1905-6,	Wenham line,	Southerly,	2.01	7,132	37
Billerica,	1908,	Near "Common,"	Southwesterly,	3.67		
Blackstone,	1899-1900-2-9,	Dixbridge line,	Southwesterly,	.58	22,702	69
Blackstone,	1905,	Bellingham line to Woonsocket line,	Southwesterly,	2.55		
Blackstone,	1913,	Woonsocket line,	Northwesterly,	.06	133,592	53
Boston,	1908,	Dedham line to Lagrange Street,	Northwesterly,	1.12	55,675	13
Bourne,	1897-8-1904,	Cohasset Narrows,	Northwesterly,	1.40	20,568	34
Bourne,	1903-5-7-10-11,	Back River bridge,	Easterly,	2.09	14,798	70
Bourne,	1913,	Plymouth line,	Falmouth line,	5.30	31,014	22
Boxborough,	1897-9-1905-7,	Action line to Harvard line,	Southwesterly,	1.05		
Braintree,	1900-2,	Quincy line to Fore River,	Northwesterly,	3.31		
Brewster,	1895-6-7-1901,	Dennis line to Orleans line,	Southwesterly,	1.06	7.78	
Brewster,	1908,	Orleans line to Chatham line,	Easterly,	.04		
Bridgewater,	1904-5-6-7-8,	Taunton River,	Southerly,	8.47	25,481	79
Brimfield,	1897-9,	Monson line,	Southerly,	2.34	24,918	21
Brimfield,	1901-2,	Wales line,	Northerly,	1.63		

¹ Exclusive of 1,100 feet at railroad crossing.

² Exclusive of 1,050 feet at railroad crossing.

³ Exclusive of 143 feet at Boston & Maine bridge.

⁴ Exclusive of 275 feet at railroad crossing.

SHOWING THE HIGHWAYS LAID OUT OR CONTRACTED FOR BY THE MASSACHUSETTS HIGHWAY COMMISSION, ETC. — *Continued.*

TOWN OR CITY.	Year.	ROADS LAID OUT.			Length (Miles).	Construction Ex- penditures to Dec. 1, 1913.
		From —	Direction.	Length (Miles).		
Brockton,	1897-8-9,	Easton line,	Easterly,	1.87	1.87	\$31,490 15
Brockton,	1900,	Abington line,	Westerly, . . . . .	.66	.66	
Brockton,	1904,	West Bridgewater line,	Northerly, . . . . .	.66	.66	
Brookfield,	1897-8-1900-2-3-4,	West Brookfield line to Brookfield village,	Easterly,	3.12	3.12	
Brookfield,	1905-7,	Spencer line,	Southwesterly, . . . . .	.77	.77	54,514 40
Brookfield,	1912,	North Brookfield line to railroad,	Southerly, . . . . .	.74	.74	
Buckland,	1894-5-6-7-8-9-1900-3-7,	Shelburne Falls station,	Westerly and southerly,	4.28	4.28	66,933 85
Burlington,	1913,	Scott's bridge,	Southeasterly, . . . . .	.02	.02	
Burlington,	1903-4-5-6,	Woburn line to Billerica line,	Northerly,	3.80	3.80	33,666 12
Canton,	1905-6-7-8,	Stoughton line,	Northerly,	3.23	3.23	25,555 23
Charlestown,	1897-8-9,	Deerfield River bridge,	Easterly, . . . . .	.77	.77	
Charlestown,	1912,	Point on West Road,	Southerly, . . . . .	.15	.15	
Charlestown,	1913,	Easterly end of Deerfield River bridge,	Southeasterly, . . . . .	.16	.16	52,684 81
Charlestown,	1913,	Scott's bridge,	Northerly, . . . . .	.02	.02	
Charlton,	1901-2,	Charlton Depot to Charlton City,	Southerly,	1.91	1.91	
Charlton,	1905-6-7-10-11-12,	Oxford line to Charlton City,	Southwesterly,	4.84	4.16	
Charlton,	1909,	Near Charlton City,	Southerly, . . . . .	.29	.29	
Charlton,	1913,	Southerly end of 1909 section to South- bridge Street,	Southwesterly, . . . . .	.87	.87	82,476 45
Chatham,	1899-1901-2-5-6,	Depot Street to Harwich line,	Westerly,	4.04	4.04	45,802 27
Chatham,	1907,	Depot Street to Harwich line,	Northerly,	3.13	3.13	
Chatham,	1898-9-1901-7-10,	Lowell line to Tyngsborough line,	Westerly and northerly,	2.42	2.42	57,923 34
Chelmsford,	1903-4,	Lowell line toward Chelmsford Center,	Southwesterly,	1.27	1.27	
Chelmsford,	1908-11,	Near Chelmsford Center,	Southwesterly,	2.52	2.52	
Chelsea,	1901-4,	Lewis Street and Eastern Avenue,	Southwesterly, . . . . .	.96	.96	25,382 66
Cheshire,	1899-1900-1-2-10,	Lanesborough line,	Northeasterly,	4.19	4.19	
Cheshire,	1913,	Connecting 1900-01 sections, . . . . .	—, . . . . .	.19	.19	65,025 54
Cheshire,	1899-1900-1-2-4-5-9-10-11,	Northeasterly end of 1902 section,	Northeasterly,	1.30	1.30	
Chilmark,	1897-8-9,	Becket line to Huntington line,	Southwesterly,	6.62	6.62	74,428 00
Chilmark,	1902-3-4-5-6-7,	Springfield line,	Northerly, . . . . .	.92	.92	51,993 79
Chilmark,	1905-6-8-9-11,	Chitopee River,	Northerly,	2.97	2.97	
Chilmark,	1913,	West Tisbury line,	Southwesterly,	6.12	6.12	35,219 35
Clarksburg,	1905-7,	Near Bettlebung Corner,	Southwesterly,	1.67	1.67	
Clarksburg,	1909,	North Adams line,	Northeasterly and northerly, . . . . .	.97	.97	
Clarksburg,	1913,	Red Mill bridge,	Northerly, . . . . .	.12	.12	14,466 74
Clarksburg,	1913,	Mountain Road, . . . . .	—, . . . . .	.12	.12	

SHOWING THE HIGHWAYS LAID OUT OR CONTRACTED FOR BY THE MASSACHUSETTS HIGHWAY COMMISSION, ETC. — *Continued.*

TOWN OR CITY.	Year.	ROADS LAID OUT.			Length constructed (Miles).	Construction Expenditures to Dec. 1, 1913.
		From —	Direction.	Length (Miles).		
Fitchburg.	1894-5,	Westminster line,	Easterly,	.97	.97	\$51,124 34
Fitchburg.	1897,	Lunenburg line,	Westerly,	.60	.60	
Fitchburg.	1900-1-3-4,	Asby line,	Southerly,	2.55	2.55	1,655 69
Florida.	1913,	Savoy line,	Easterly,	.03		
Foxborough,	1901-2,	Mansfield line,	Northerly,	1.81	1.81	19,337 02
Foxborough,	1905-8,	Wrentham line,	Southeasterly,	1.70	1.70	
Frammingham,	1904-5,	Southborough line, Pleasant Street,	Southeasterly,	2.42	2.42	17,261 67
Frammingham,	1910,	Ashtland line, Hollis Street,	Northerly,	.79	.79	
Franklin,	1905-7-10,	Bellingham line,	Northeasterly,	2.58	2.58	29,713 89
Franklin,	1911,	Wrentham line,	Northwesterly,	1.18	1.18	
Freetown,	1902-3,	New Bedford line to Lakeville line,	Northerly,	3.19	3.19	18,524 71
Freetown,	1908,	Fall River line to Assonet,	Northeasterly,	.68	.68	
Gardner,	1897-8,	Templeton line,	Easterly,	2.38	2.38	44,487 05
Gardner,	1900-1,	Westminster line,	Northwesterly,	.98	.98	
Gay Head,	1913,	Chilmark line,	Northwesterly,	3.14		
Gill,	1912,	Barnardston line to Northfield line,	Easterly,	.28	.28	4,518 52
Gloucester,	1894-5-8-1905-6-7,	Manchester line to Cut bridge,	Northerly,	3.46	3.46	47,961 90
Gloucester,	1907,	Rockport line,	Southerly,	.52	.52	
Goshen,	1894-5-8,	Williamsburg line,	Northwesterly,	2.46	2.46	46,440 20
Grafton,	1897-9-1900-5-12,	Millbury line,	Southerly,	3.69	3.69	52,459 00
Grafton,	1913,	Southerly end of 1912 section,	Southeasterly,	1.25	1.25	
Granby,	1894-1902-5-6-8,	South Hadley line,	Easterly,	2.26	2.26	
Granby,	1911,	North Street,	Easterly,	1.50	1.50	
Granby,	1913,	Easterly end of 1911 section,	Southeasterly,	1.10	1.10	58,019 92
Great Barrington,	1894-6-7-1902,	Housatonic River bridge,	Easterly,	3.41	3.41	44,862 68
Greenfield, ¹	1895-1900-2,	Washington Street,	Easterly,	1.33	1.33	
Greenfield,	1903-6-7-8-10,	Barnardston line,	Northwesterly,	3.77	3.77	43,610 11
Greenfield,	1903,	Point on Colrain Road,	Northwesterly,	.26	.26	
Groton,	1901-2-7,	Pepperell line,	Southeasterly,	1.41	1.41	28,906 25
Groveland,	1900-1-2-5,	Morrison River bridge to West, Newbury line,	Northwesterly,	1.72	1.72	22,613 35
Hadley,	1894-1904,	Connecticut River to Amherst line,	Easterly,	4.69	4.69	73,387 00
Hamilton,	1899-1900,	Ipswich line,	Southwesterly,	1.44	1.44	
Hamilton,	1909-10,	Wenham line,	Northwesterly,	1.22	1.22	25,771 20
Hancock,	1895-6-8-9,	Pittsfield line to New York State line,	Westerly,	3.23	3.23	51,928 79
Hanover,	1906-8,	Pembroke line,	Northwesterly,	1.85	1.85	5,041 43

SHOWING THE HIGHWAYS LAID OUT OR CONTRACTED FOR BY THE MASSACHUSETTS HIGHWAY COMMISSION, ETC. — *Continued.*

TOWN OR CITY.	Year.	ROADS LAID OUT.			Length constructed to Dec. 1, 1913.	Construction Expenditures to Dec. 1, 1913.
		From —	Direction.	Length (Miles).		
Lincoln,	1895-6-7,	Lexington line to Concord line,	Northwesterly,	2.06	2.06	\$16,883 77
Littleton,	1902-3-4,	Acton line, Great Road,	Northerly,	2.65	2.65	
Littleton,	1902,	Westford line to Great Road,	Southwesterly, . . . . .	.32	.32	34,737 98
Littleton,	1912,	Ayer line,	Southwesterly, . . . . .	.86	.86	
Littleton,	1913,	Southwesterly end of 1912 section,	Southwesterly, . . . . .	.77	.77	
Lowell (boulevard),	1897,	Tyngsborough line,	Easterly, . . . . .	.97	.97	
Lowell (Princeton Street),	1897-8,	Chelmsford line,	Easterly,	1.33	1.33	22,899 99
Lowell,	1900,	Tewksbury line,	Northwesterly, . . . . .	.35	.35	
Lunenburg,	1898-9-1900-1-3-10,	Fitchburg line,	Easterly,	4.12	4.12	
Lynn,	1913,	Easterly end of 1910 section to Shirley line,	Southwesterly,	1.77	1.77	55,611 05
Mansfield,	1898,	Saugus River to Sea Street,	Northwesterly, . . . . .	.90	.90	140,944 06
Mansfield,	1901,	Foxborough line,	Southwesterly, . . . . .	.72	.72	10,068 19
Mansfield,	1906,	Norton line,	Northerly, . . . . .	.49	.49	
Marion,	1894-5-1911,	Marion village to Wareham line,	Northwesterly,	1.59	1.59	30,984 13
Marion,	1897-9-1901-2,	Marion village to Mattapoisett line,	Westerly,	1.84	1.84	
Marion,	1903,	Marion village to Rochester line,	Northwesterly,	2.14	2.14	
Marlborough (east),	1897-1902-3-4,	Sudbury line to Hosmer Street,	Westerly,	3.10	3.10	
Marlborough (west),	1897-9-1900-1,	Northborough line,	Westerly,	2.42	2.42	69,600 54
Marlborough,	1908-11,	Duxbury line,	Easterly,	1.27	1.27	
Marshfield,	1894-1910,	Duxbury line to North River bridge,	Southwesterly and southwesterly,	8.28	8.28	54,406 40
Mattapoisett,	1894-5,	Fairhaven line,	Northwesterly,	1.16	1.16	24,528 57
Mattapoisett,	1900-1-3,	Marion line,	Westerly,	2.05	2.05	
Mashpee,	1911-12,	Falmouth line northerly,	Northwesterly,	3.18	3.18	32,700 72
Mashpee,	1913,	Somerville line via Mystic Avenue,	Northwesterly,	1.43	1.43	
Medford,	1907,	Saugus line, Upham Street,	Northerly, . . . . .	.86	.86	30,974 24
Melrose,	1906,	Haverhill line,	Westerly, . . . . .	.40	.40	5,056 40
Merrimac,	1897-8-9-10,	Amsbury line,	Easterly,	1.03	1.03	23,302 69
Merrimac,	1901-3,	Lawrence line to Haverhill line,	Southwesterly,	1.20	1.20	41,214 04
Methuen,	1896-1908,	Dracut line,	Northwesterly,	3.69	3.69	63,056 15
Middleborough,	1894-1903,	Nemasket River to Rochester line,	Southwesterly,	1.19	1.19	18,144 56
Middleborough,	1906-7-8,	Bridgewater line to railroad bridge,	Southwesterly,	8.98	8.98	
Middleton,	1912,	North Andover line,	Southwesterly,	3.47	3.47	
Middleton,	1913,	Southwesterly end of 1912 section,	Southwesterly, . . . . .	.61	.61	
Milford,	1904-5,	Hopedale line via West Street,	Southwesterly,	1.75	1.75	31,163 99
Milford,	1909-10,	Holliston line,	Southwesterly,	1.80	1.80	

Millbury,	1902,	Worcester line to Grafton line,	Southwesterly,	78	78
Millbury,	1900-3-4,	Worcester line, Main Street,	Southerly,	1.61	1.61
Millbury,	1906,	Sutton line,	Northeasterly, . . . . .	.59	.59
Milton, 1	1899-1900,	Neponset River at Granite bridge,	Southwesterly, . . . . .	.87	.87
Monson,	1894,	Railroad bridge toward Palmer,	Northerly, . . . . .	.93	.93
Monson,	1901-5,	Palmer line to Brimfield line,	Southwesterly, . . . . .	.39	.39
Monson,	1908,	Palmer line,	Easterly and westerly, . . . . .	.29	.29
Montague,	1898-9-1904-6-10,	Third Street near L Street, Turners Falls,	Easterly,	4.05	4.05
Montague,	1905-9,	Connecticut River bridge,	Northeasterly,	1.68	1.68
Naticket,	1894-1903,	First milestone to Sissonset,	Easterly,	6.48	6.48
Naticket,	1901,	Wellesley line to Lincoln Square,	Westerly,	1.14	1.14
Naticket,	1903,	Sherborn line to Cemetery Street,	Easterly,	2.06	2.06
Naticket,	1901,	Newton line,	Westerly,	1.00	1.00
Needham,	1905,	Charles River bridge, Chestnut Street,	Northerly,	1.03	1.03
Needham,	1897,	Hardwick line to Ware line,	Southerly, . . . . .	.17	.17
New Braintree,	1903,	New Braintree village,	Northerly, . . . . .	.23	.23
New Braintree,	1899-1906,	Newburyport line to Rowley line,	Southerly and southwesterly,	4.23	4.23
Newburyport,	1896-7-8,	West Newbury line,	Easterly,	1.75	1.75
Newburyport,	1913,	Bridge Street to River bridge,	Northerly, . . . . .	.08	.08
Newton,	1901,	Needham line,	Easterly,	1.03	1.03
Norfolk,	1894-6-7,	Walpole line to Wrentham line,	Southwesterly,	1.45	1.45
North Adams,	1895,	Williamstown line,	Easterly,	2.13	2.13
North Adams,	1900-1-2-3,	Ashland Street bridge to Adams line,	Southerly,	2.35	2.35
North Adams,	1913,	Boundary between North Adams and Florida,	Northerly,	1.83	1.83
North Andover,	1900-2-4,	Lawrence line,	Southwesterly,	1.90	1.90
North Andover,	1907-10-11-12,	Osgood, Park, Pleasant and Court Streets to Haverhill line,	Northerly,	3.71	3.71
North Andover,	1913,	Andover Street,	Southwesterly,	1.99	1.99
Northampton,	1894,	Hadley bridge,	Southwesterly, . . . . .	.56	.56
Northampton,	1897-8-9-1900-5,	Easthampton line, River Road,	Northeasterly,	1.47	1.47
Northampton,	1912,	Easthampton line, Laurel Park Road,	Northerly,	1.42	1.42
Northampton,	1912,	Hadfield line,	Southwesterly, . . . . .	.84	.84
North Attleborough,	1894-5-6-7-9,	Bruce Avenue to Attleborough line,	Southwesterly,	3.60	3.60
Northborough (east),	1897-8-1911,	Marlborough line,	Southwesterly,	1.80	1.80
Northborough (west),	1900-2-4,	Shrewsbury line,	Southwesterly,	2.19	2.19
Northborough (south),	1897,	Westborough line,	Easterly, . . . . .	.47	.47
Northbridge,	1913,	Grafton line,	Northeasterly, . . . . .	.78	.78
North Brookfield,	1905-6-7-8-10,	Brookfield line,	Southwesterly,	2.25	2.25
Northfield,	1901-2-12,	Barnardston line,	Northerly,	3.04	3.04
Northfield,	1912,	New Hampshire line to Pine Street,	Northeasterly and easterly,	1.24	1.24
North Reading,	1897-8-1901-3-11,	Andover line to Reading line,	Southerly,	2.54	2.54
Norton,	1906,	Mansfield line,	Southerly, . . . . .	.50	.50
Norton,	1908-9-11,	Attleborough line to railroad station,	Easterly,	4.19	4.19

¹ Exclusive of 1,000 feet at railroad crossing.

SHOWING THE HIGHWAYS LAID OUT OR CONTRACTED FOR BY THE MASSACHUSETTS HIGHWAY COMMISSION, ETC. — *Continued.*

TOWN OR CITY.	Year.	ROADS LAID OUT.			Length constructed (Miles).	Construction Expenditures to Dec. 1, 1913.
		From —	Direction.	Length (Miles).		
Norwood (south),	1887-9,	Walpole line,	Northerly,	1.03	1.03	\$19,795 30
Norwood (north),	1885-6,	Westwood line,	Southerly,	1.04	1.04	
Oak Bluffs,	1894-5-6,	Sengokontacket bridge,	Northerly,	2.37	2.37	20,929 85
Orange,	1894-5-7,	Atoll line,	Westerly,	2.18	2.18	52,968 56
Orange,	1900-1-3-4-5,	Erving line,	Easterly,	2.62	2.62	
Orleans,	1900-1-4,	Brewster line to Eastham line,	Northeasterly,	1.98	1.98	
Orleans,	1903-4-5,	Brewster line towards Shattuck's Corner,	Northerly and northwesterly,	2.72	2.72	20,346 46
Oxford,	1906-7,	Auburn line,	Southwesterly,	1.85	1.85	
Oxford,	1908-9,	Charlton line,	Southwesterly,	1.34	1.34	31,765 85
Oxford,	1913,	Webster line,	Northeasterly,	1.85	1.85	
Palmer,	1899-1900-1,	Tennyville to Monson line,	Southwesterly,	2.82	2.82	
Palmer,	1903-8,	Near Quabog River to Warren line,	Southwesterly,	5.29	5.29	129,193 48
Palmer,	1906-8-9,	Wilbraham line,	Easterly,	2.11	2.11	
Palmer,	1913,	Westerly end of 1899 section,	Westerly,	1.12	1.12	
Paxton,	1895-1902,	Worcester line,	Northerly,	3.60	3.60	48,202 62
Pembroke,	1905,	Hanover line,	Southerly,	3.35	3.35	2,943 64
Pepperell,	1907-10-11,	Nashua River bridge,	Northerly,	2.00	2.00	23,541 69
Phillipston,	1897-8-1902-4-9,	Atoll line to Templeton line,	Northerly and northeasterly,	2.78	2.78	31,102 16
Pittsfield,	1894-8-1901-2-9,	Hancock line,	Easterly,	3.05	3.05	
Pittsfield,	1913,	Connecting 1902 and 1909 sections,	—	.59	.59	
Pittsfield,	1897-1906-7,	Dalton line,	Southwesterly,	2.37	2.37	98,444 31
Pittsfield,	1913,	Lauesborough line and Dalton Road,	Southerly,	1.47	1.47	
Pittsfield,	1894-5,	South Mountain Road to Lenox line,	Southerly,	1.58	1.58	
Plainville,	1894-5-11,	Wrentham line to North Attleborough line,	Southerly,	2.30	2.30	6,075 98
Plymouth,	1894-1904,	Manomet village,	Northerly,	5.05	5.05	
Plymouth,	1907-10-11,	Manomet village,	Southerly,	4.86	4.86	104,171 25
Plymouth,	1913,	Southerly end of 1911 section,	Southerly,	2.06	2.06	
Princeton,	1897-1900-2-3,	Princeton depot,	Easterly,	2.23	2.23	21,927 60
Provincetown,	1901-3,	Truro line to Allerton Street,	Westerly,	1.10	1.10	7,669 68
Quincy,	1899,	Chubbuck Street to Fore River bridge,	—	.49	.49	
Quincy,	1902-9,	Braintree line,	Southwesterly,	1.95	1.95	26,587 83
Quincy,	1904,	Randolph line to Milton line,	Northerly,	1.23	1.23	
Randolph,	1902-3-8,	Quincy line,	Southerly,	1.90	1.90	13,265 20
Rayham,	1901-2-3,	Taunton line, Dean Street,	Northeasterly,	1.48	1.48	
Rayham,	1912,	Southerly end of Hockamock Swamp,	Southerly,	.96	.96	31,808 04
Raynham,	1913,	Southerly end of 1912 section,	Southwesterly,	1.72	1.72	

Reading,	1890-1900,	Stoneham line,	Northerly,	1.07	29,074 15
Reading,	1902-3,	North Reading line,	Southerly,	2.67	
Rehoboth,	1895-1903,	Seekonk line to Dighton line,	Easterly,	6.03	59,608 98
Rehoboth,	1912,	Swansea line to Seekonk line,	Northerly,	.51	
Revere,	1897-8,	Boston line,	Northerly,	.58	
Revere,	1899,	Saugus line,	Northerly,	.67	73,334 18
Revere,	1913,	Southerly end of 1899 section,	Southerly,	.44	
Revere,	1913,	Point of Pines to Revere Street,	Northerly,	2.06	
Richmond,	1897-1907,	Railroad station to Pittsfield line,	Northerly,	4.02	33,210 96
Rochester,	1903,	Marton line to Acushnet line,	Northerly,	5.27	6,674 70
Rochester,	1909,	Middleborough line to Wareham line,	Northerly,	2.35	13,442 30
Rockland,	1902-5-6,	Abington line to Hanover line,	Northerly,	1.60	20,963 28
Rockport,	1902-6-10,	Gloucester line,	Northerly,	2.90	21,727 44
Rowley,	1905-7-8-9,	Newbury line,	Northerly,	.74	
Rutland,	1911,	Ipswich line,	Northerly,	.74	
Rutland,	1894-5-6-7-8-9,	Westfield line to Huntington line,	Northerly,	6.66	84,372 06
Salem,	1904,	Holden line,	Northerly,	1.16	8,981 39
Salem,	1901-9,	Swampscott line,	Northerly,	1.40	18,080 66
Salisbury,	1904-5-12,	Salisbury village to Newburyport bridge,	Northerly,	1.56	
Salisbury,	1910,	New Hampshire line to village,	Northerly,	2.41	
Salisbury,	1911-12,	Amesbury line,	Northerly,	1.74	54,649 62
Salisbury,	1913,	Salisbury Square to Salisbury Beach,	Northerly,	.76	
Sandwich,	1897-8-1900-2-10,	Barnstable line,	Northerly,	4.31	
Sandwich,	1912,	Bourne line,	Northerly,	1.81	58,294 12
Sandwich,	1913,	Northerly end of 1911 section,	Northerly,	.85	
Saugus,	1913,	Northerly end of 1912 section,	Northerly,	.45	
Saugus,	1899,	Northerly end of 1898 section,	Northerly,	.04	
Saugus,	1906,	Fox Hill bridge to Revere line,	Northerly,	1.60	35,834 90
Saugus,	1913,	Melrose line,	Northerly,	.19	
Savoy,	1894-1910,	Florida and Savoy at Cold River,	Northerly,	.04	1,655 69
Seaboard,	1900-1-2-4,	Cohasset line to Marshfield line,	Northerly,	5.37	49,026 54
Seekonk,	1910-11,	Rehoboth line to Rhode Island line,	Northerly,	2.76	
Seekonk,	1913,	Perry Avenue via Fall River Avenue,	Northerly,	2.51	43,126 52
Seekonk,	1908,	Rehoboth line,	Northerly,	.76	
Sharon,	1912,	Foxborough line,	Northerly,	.64	4,849 32
Shelfield,	1913,	Connecticut line via Under Mountain Road,	Northerly,	1.78	
Shelfield,	1894-5-6,	Northerly end of 1912 section,	Northerly,	1.36	21,811 00
Shirley,	1913,	Bridge Street to Colrain line,	Northerly,	2.16	24,024 14
Shrewsbury,	1895-1904,	Ayer line,	Northerly,	.64	4,768 88
Somerset,	1895-1910,	Worcester line to Northborough line,	Northerly,	4.86	48,948 67
Somerset,	1903-4-9,	Slades Ferry bridge, to Swansea line,	Northerly,	5.38	
Somerset,	1909,	Slades Ferry bridge, Brayton Avenue,	Northerly,	2.40	66,364 84

1 Exclusive of 600 feet at railroad crossing.

SHOWING THE HIGHWAYS LAID OUT OR CONTRACTED FOR BY THE MASSACHUSETTS HIGHWAY COMMISSION, ETC. — *Continued.*

TOWN OR CITY.	Year.	ROADS LAID OUT.			Length constructed (Miles).	Construction Expenditures to Dec. 1, 1913.
		From —	Direction.	Length (Miles).		
Somerville,	1908,	Medford line via Mystic Avenue,	Southeasterly,	1.16	1.16	\$35,822 22
Southampton,	1905-9,	Easthampton line,	Southerly, . . . . .	.71	.71	13,948 99
Southborough,	1902-5,	Westborough line,	Easterly,	1.89	1.89	22,148 17
Southborough,	1907,	Ashland line,	Westerly, . . . . .	.65	.65	
Southborough,	1909,	Frankingham line,	Southwesterly,	1.15	1.15	
Southbridge,	1902,	Charlton line,	Southwesterly, . . . . .	.91	.91	11,058 43
Southbridge,	1907,	Sturbridge line,	Easterly, . . . . .	.45	.45	
South Hadley,	1895-7-8-9-1900,	Granby line to South Hadley Falls,	Southwesterly,	2.42	2.42	63,659 75
South Hadley,	1903-4-9-12,	South Hadley Falls to Granby line,	Northeasterly,	4.64	4.64	
Spencer,	1897-1900-1,	Leicester line,	Westerly,	1.60	1.60	45,013 36
Sterling,	1897-8-10-11,	Brookfield line to Seven Mile River bridge,	Easterly,	1.46	1.46	
Sterling,	1897-8-1912,	Near town hall to West Boylston line,	Southerly,	2.70	2.70	
Sterling,	1905-7-9,	Lexester line,	Southwesterly,	1.84	1.84	59,481 60
Sterling,	1906-7,	Leicester line,	Southerly, . . . . .	.56	.56	
Sterling,	1913,	Smith's Corner,	Northeasterly, . . . . .	.70	.70	
Stockbridge,	1905-9,	Lee line at South Lee,	Westerly,	1.06	1.06	23,500 43
Stockbridge,	1906,	Lee line at East Street,	Southwesterly,	2.24	2.24	
Stoneham,	1907-8,	South Street,	Northerly, . . . . .	.57	.57	14,894 66
Stoneham,	1900-1,	Reading line,	Southerly,	1.01	1.01	
Stoughton,	1902-3,	Canton line to Lincoln Street,	Northerly,	1.16	1.16	21,030 80
Stoughton,	1904-5,	Easton line to Walnut Street,	Northerly,	2.14	2.14	29,215 04
Sturbridge,	1897-1903-4-7-9,	Sturbridge line,	Northwesterly,	2.36	2.36	36,242 51
Sudbury,	1897-8-1900-1-2-3,	Marlborough line to Wayland line,	Easterly,	5.11	5.11	35,552 42
Sunderland,	1897-1903-4-5-7-9,	Connecticut River bridge,	Southeasterly and southerly,	1.56	1.56	
Sunderland,	1913,	Amherst line,	Northwesterly, . . . . .	.98	.98	
Sutton,	1899-1901-2,	Millbury line,	Southerly,	1.46	1.46	15,405 41
Sutton,	1903-4,	Douglas line at Manchung,	Northerly, . . . . .	.82	.82	29,433 53
Swampscott,	1897-1900-1,	Salem line to Burrall Street,	Southwesterly,	1.49	1.49	39,351 25
Ware,	1903-6-7-9-10-11-12,	Somerset line to Rehoboth line,	Northwesterly,	6.65	6.65	
Taunton,	1895-6-8-9-1900-1,	Dighton line, Winthrop Street,	Easterly,	2.94	2.94	
Taunton,	1905-6,	Dighton line, Somerset Avenue,	Northeasterly,	1.07	1.07	
Taunton,	1913,	Northeasterly end of 1905 section,	Northeasterly, . . . . .	.26	.26	63,191 37
Taunton,	1907,	Railroad crossing, County Street,	Southeasterly, . . . . .	.66	.66	
Taunton,	1913,	Southeasterly end of 1907 section,	Southeasterly,	1.27	1.27	
Taunton,	1912,	Raynham line at Otter River,	Southerly,	1.73	1.73	
Taunton,	1899-1901-2-3,	Gardner line at Broadway,	Westerly,	2.00	2.00	66,578 35
Templeton,	1905-6-7-8-9,	Phillipston line to Baldwinville,	Northeasterly,	3.69	3.69	

Tewksbury,	1900-1-2-3-4-5-6,	Lowell line to Wilmington line,	Southeasterly,	6.00	53,594 83
Tisbury,	1894,	Vineyard Haven to West Tisbury line,	Southwesterly,	1.93	14,611 70
Townsend,	1890-1911,	Groton line to Ashby line,	Westerly,	6.04	46,947 45
Truro,	1895-1906,	Welfleet line via Kelley's Corner,	Northerly,	3.16	42,456 56
Tyngsborough,	1895-6,	Tyngsborough bridge to Lowell line,	Southeasterly,	2.95	
Tyngsborough,	1909,	New Hampshire line,	Southerly,	1.87	
Tyngsborough,	1910-11-12,	Chelmsford line,	Southwesterly,	1.95	57,947 79
Uxbridge,	1913,	Connecting 1909 and 1912 sections,	Northwesterly,	.16	
Uxbridge,	1897-8-1901-3-9-10,	Blackstone line to Blackstone River,	Northwesterly,	2.94	
Uxbridge,	1912,	Northbridge line to Mumford River bridge,	Southwesterly,	.36	32,376 81
Wales,	1901,	Brimfield line,	Southwesterly,	1.04	3,963 17
Walpole (south), ³	1894-5-7-1900-12,	Norfolk line,	Northwesterly,	3.06	50,998 64
Walpole (north),	1897-8-1900-11,	Norwood line,	Southerly,	1.97	
Ware,	1897-9-1900-3,	New Braintree line,	Southerly,	2.28	28,913 82
Ware,	1909-10,	Union of Palmer and Belchertown roads,	Northwesterly,	1.90	
Wareham,	1896-1901-6-7-10,	Weaver's River bridge to High Street,	Northwesterly,	2.20	
Wareham,	1898-1901,	Cohasset Narrows bridge,	Westerly,	1.82	58,887 28
Wareham,	1905-6-7-8,	Parker's Mills to Rochester line,	Northwesterly,	3.42	
Wareham,	1910,	Wareham Narrows bridge,	Easterly,	.88	
Wareham,	1913,	Westerly end of 1901 section,	Southwesterly,	.16	
Warren,	1896-7-8-1907-8,	Warren Village to Palmer line,	Westerly,	2.68	45,749 42
Warren,	1899-1900-1,	Warren Village to West Brookfield line,	Easterly,	1.42	13,066 99
Watertown,	1895-6,	Walham line,	Westerly,	.85	21,506 92
Wayland, ³	1897-1900-3,	Weston line to Sudbury line,	Westerly,	2.58	
Webster,	1908-12,	Lake Street and Thompson Road to Con- necticut line,	Southerly,	1.76	22,277 28
Webster,	1911,	Oxford line,	Southerly,	.84	
Wellesley,	1901,	Natick line to Blossom Street,	Easterly,	1.18	6,849 11
Welfleet,	1903-4-5-7,	Eastham line,	Northerly,	4.65	9,364 18
Wenham,	1897-1901-3,	Beverly line to Hamilton line,	Northerly,	1.76	13,178 53
Westborough,	1903-6,	Southborough line,	Southwesterly,	2.27	22,570 37
Westborough,	1897,	Northborough line,	Southwesterly,	.72	
West Boylston,	1897-8,	Worcester line,	Northerly,	1.55	33,466 97
West Boylston,	1913,	Sterling line,	Southerly,	.89	
West Bridgewater,	1900-1-2-4,	Brookton line to Bridgewater line,	Southerly,	3.16	16,371 19
West Brookfield,	1899,	Ware line to Ware line,	Southwesterly,	.15	
West Brookfield,	1899-1900-1,	Brookfield line,	Northwesterly,	1.51	29,371 41
West Brookfield,	1905,	Warren line,	Northwesterly,	1.02	
West Brookfield,	1913,	Quabog River bridge,	Easterly and westerly,	1.14	
Westfield,	1894-6-8-9,	West Springfield line,	Westerly,	2.22	
Westfield,	1898-9-1900-1-2,	Russell line,	Easterly,	3.59	46,019 84

¹ Exclusive of 220 feet at railroad bridge.² Exclusive of 250 feet at railroad bridge.³ Exclusive of 175 feet at railroad bridge.⁴ Exclusive of 1,500 feet at railroad crossing and Concord River.

SHOWING THE HIGHWAYS LAID OUT OR CONTRACTED FOR BY THE MASSACHUSETTS HIGHWAY COMMISSION, ETC. — *Concluded.*

TOWN OR CITY.	Year.	ROADS LAID OUT.			Length constructed (Miles).	Construction expenditures to Dec. 1, 1913.
		From —	Direction.	Length (Miles).		
Westford.	1902-3.	Littleton line.	Northerly.	3.25	3.25	\$14,422 98
Westford.	1912.	Chelmsford line to 1903 section.	Southwesterly.	1.70	1.70	55,133 67
Westminster.	1894-5-6-7-8-9.	Fitchburg line.	Southwesterly.	3.00	3.00	58,726 45
Westminster.	1903.	Gardner line.	Easterly.	2.25	2.25	16,209 94
West Newbury.	1895-6-7-1903-4-5-6-9.	Newburyport line to Groveland line.	Westerly.	5.09	5.09	50,029 90
Weston.	1898-9.	Wayland line to near Stony Brook.	Easterly.	3.15	3.15	32,944 46
Weston.	1894-6-7-8.	Dartmouth line.	Westerly.	4.25	4.25	29,713 90
Westport. ¹	1913.	Connecting 1897 and 1898 sections.	Southwesterly.	1.20	1.10	8,072 82
West Springfield.	1895-6.	Tatham Hill.	Easterly.	1.91	1.91	46,173 54
West Tisbury.	1895-6-7-1904.	Tisbury line to Chilmark line.	Easterly and westerly.	5.79	5.35	33,314 16
Westwood.	1899-1900-13.	Norwood line to Dedham line.	Southwesterly.	5.35	5.35	26,045 10
Weymouth.	1894.	Holbrook line to Abington line.	Northerly.	1.07	1.07	54,885 48
Weymouth.	1895-6-7.	Fore River to Back River.	Easterly.	1.25	1.25	34,688 22
Weymouth.	1903-4-7-8-10.	Broad Street via Washington to Abington line.	Easterly.	1.75	1.75	35,062 03
Whately. ²	1913.	At railroad bridge.	Southerly.	4.94	4.94	37,851 05
Whately. ²	1899-1901-2-3-4-5-6.	Deerfield line to Hatfield line.	Southerly.	1.14	1.14	14,351 07
Whitman.	1894-5-6.	Brookton line.	Easterly.	3.89	3.89	28,345 85
Whitman.	1913.	East Bridgewater line.	Northerly.	1.70	1.70	25,607 00
Wilbraham. ³	1894-5-6-1901-3-4.	Springfield line to Palmer line.	Northerly.	1.40	1.40	
Wilbraham.	1913.	North Wilbraham village.	Easterly.	4.82	4.82	
Williamstown.	1896-8-1901-3.	Goshen line.	—	.25	.25	
Williamstown.	1907.	River Road from village.	Southwesterly.	2.65	2.65	
Williamstown.	1895-6-8-1903.	North Adams line.	Southerly.	1.13	1.13	
Wilmington. ⁴	1907-8-10-11.	Tewksbury line.	Westerly.	1.48	1.48	
Winchendon.	1907.	Glen Allen Road via Maple Street.	Southerly.	3.67	3.67	
Winchendon.	1899-1900.	Miller's River bridge, River Street.	Southwesterly.	1.35	1.35	
Windsor.	1897-1902-3.	Arlington line to Woburn line.	Southwesterly.	1.35	1.35	
Windsor.	1913.	Cummington line.	Northeasterly.	1.96	1.96	
Windsor.	1906-7.	Northwesterly end of 1903 section.	Westerly.	.98	.98	
Windsor.	1900-1-2.	Cummington Road, Windsor post office.	Easterly.	1.61	1.50	
Woburn.	1912.	Winchester line to Burlington line.	Northwesterly.	.88	.88	
Woburn.	1913.	Wilmington line.	Southwesterly.	.58	.58	
Woburn.		North Main and Elm Streets.	Southerly.	.40	.40	

Worcester,	1896-7,	Patton line,	.	.	.	1.35	} 47,329 14
Worcester,	1897-7, 1903,	Folden line,	.	.	.	1.50	
Worcester,	1900-5,	West B. line,	.	.	.	1.22	
Wrentham,	1897-1900-1,	Wrentham line,	.	.	.	2.23	
Wrentham,	1897-8-1902,	Plainville line,	.	.	.	2.23	
Wrentham,	1912,	Norfolk line,	.	.	.	1.86	
Wrentham,	1913,	Framling line,	.	.	.	1.00	
Wrentham,	1915-6,	Easterly end of 1912 section,	.	.	.	1.00	
Yarmouth (north),	1895-6-7,	Barnstable line to Dennis,	.	.	.	1.04	
Yarmouth (south),	1895-6-7,	Barnstable line to Bass River bridge,	.	.	.	3.70	
		Southeasterly,	.	.	.	5.09	
		Southerly,	.	.	.	1.35	
		Southerly,	.	.	.	1.50	
		Northerly,	.	.	.	2.23	
		Southeasterly,	.	.	.	2.23	
		Southeasterly,	.	.	.	1.86	
		Southeasterly,	.	.	.	1.00	
		Easterly,	.	.	.	1.35	
		Easterly,	.	.	.	3.70	
		Easterly,	.	.	.	5.09	

¹ See Dartmouth.

2 Exclusive of 375 feet at railroad crossing and 800 feet at railroad bridge.

³ Exclusive of 1,763 feet at North Wilbraham village.

4 Exclusive of 300 feet at railroad bridge.

APPENDIX F.

TABLE SHOWING TOWNS AND CITIES IN WHICH WORK HAS BEEN DONE DURING THE YEAR 1912, AND RESIDENT ENGINEERS ON SUCH WORK, TOGETHER WITH DATES OF BEGINNING AND ENDING.

Town or City.	County.	Layout.	Resident Engineer.	Date of Contract.	Date of Beginning.	Date of Ending.
Abington,	Plymouth,	1913,	M. L. Brown,	July 30, 1913	July 30	Oct. 18
Abington,	Plymouth,	1913,	W. M. Stodder,	July 30, 1913	Oct. 19	Nov. 15
Acton,	Middlesex,	1913,	W. H. Stevenson,	April 1, 1913	April 7	July 24
Acton,	Middlesex,	1913,	J. H. Phipps,	Aug. 26, 1913	Sept. 2	Dec. 28
Amesbury,	Essex,	1913,	G. S. Stanwood,	Aug. 3, 1913	Aug. 13	Dec. 23
Amesbury,	Essex,	Chapter 525,	L. P. Henderson,	Aug. 3, 1913	Aug. 24	Nov. 18
Amherst,	Hampshire,	Chapter 525,	E. M. Briggs,	April 29, 1913	May 17	Aug. 14
Athol,	Worcester,	Surfacing,	C. R. Richmond,	Sept. 25, 1913	Oct. 4	Nov. 25
Ayer,	Middlesex,	Surfacing,	J. H. Phipps,	July 2, 1912	April 1	July 17
Ayer,	Middlesex,	1912,	Samuel Hobbs,	Aug. 19, 1913	Sept. 1	Dec. 31
Becket,	Berkshire,	1913,	A. E. Page,	Sept. 17, 1912	April 12	Sept. 15
Becket,	Berkshire,	1913,	A. E. Page,	July 15, 1913	July 15	Nov. 25
Berkley,	Bristol,	1913,	H. O. Parker,	Sept. 3, 1913	Nov. 6	Nov. 29
Blackstone,	Worcester,	1913,	M. F. Joyce,	Aug. 26, 1913	Sept. 17	Dec. 31
Bourne,	Barnstable,	1913,	J. E. Lawrence,	Aug. 26, 1913	Nov. 16	Dec. 31
Charlemont,	Franklin,	1913,	A. H. Briggs,	Sept. 9, 1913	Sept. 15	Dec. 3
Charlemont,	Franklin,	1912,	C. S. Tinkham,	Nov. 25, 1913	Oct. 13	Dec. 31
Charlemont,	Franklin,	1912,	H. D. Phillips,	Sept. 10, 1912	Jan. 1	May 12
Charlemont,	Franklin,	1912,	W. G. Adlis,	Sept. 10, 1912	May 4	Dec. 31
Charlton,	Worcester,	1912,	W. T. Short,	Sept. 10, 1912	Aug. 18	Dec. 24
Charlton,	Worcester,	1913,	H. Green,	July 30, 1913	Mar. 3	June 27
Cheshire,	Berkshire,	1913,	M. Butement,	Aug. 6, 1913	Sept. 18	Dec. 20
Cheshire,	Berkshire,	1913,	M. Butement,	Aug. 26, 1913	Oct. 3	Dec. 19
Cheshire,	Berkshire,	1913,	M. Butement,	Aug. 6, 1913	Nov. 1	Dec. 20
Chicopee,	Hampden,	1913,	E. H. Smith,	Aug. 26, 1913	Nov. 3	Dec. 3
Chilmark,	Dukes,	Surfacing,	C. R. Mosher,	May 12, 1913	Aug. 30	Sept. 13
		1913,		Oct. 1, 1913	Oct. 24	Dec. 31

Concord,	Middlesex,	1913,	J. H. Phipps,	Aug. 26, 1913	Sept. 2	Dec. 28
Cumming,	Hampshire,	Bridge,	C. M. Damon,	Aug. 15, 1913	July 30	Dec. 13
Dartmouth,	Bristol,	Surfacing,	H. O. Parker,	May 21, 1913	June 16	Sept. 9
Dedham,	Norfolk,	1913,	W. C. H. Stevenson,	Aug. 26, 1913	Sept. 3	Dec. 2
Deerfield,	Franklin,	Surfacing,	C. S. Tinkham,	May 21, 1913	May 27	July 19
Draut,	Middlesex,	1912,	R. W. Coburn,	Sept. 18, 1912	Jan. 1	Dec. 22
Draut,	Middlesex,	1912,	F. McAvoy,	Sept. 18, 1912	Jan. 1	Dec. 22
Draut,	Middlesex,	1912,	J. E. Troy,	Sept. 18, 1912	Mar. 31	Dec. 22
Easthampton,	Hampshire,	1913,	C. M. Damon,	May 27, 1913	July 5	Dec. 22
Easthampton,	Hampshire,	1913,	E. O. Knight,	May 27, 1913	July 20	Nov. 20
Essex,	Essex,	1912,	L. P. Henderson,	Nov. 6, 1912	Jan. 1	Aug. 22
Florida,	Berkshire,	1912,	H. D. Phillips,	Sept. 10, 1912	Jan. 1	Dec. 10
Florida,	Berkshire,	1912,	C. R. Raymond,	Sept. 10, 1912	Jan. 1	Dec. 10
Florida,	Berkshire,	1912,	G. H. Delano,	Sept. 10, 1912	Jan. 1	Dec. 10
Florida,	Berkshire,	1912,	R. H. Houston,	Sept. 10, 1912	Jan. 1	Dec. 10
Florida,	Berkshire,	1912,	E. A. Armington,	Sept. 10, 1912	Mar. 25	Dec. 10
Florida,	Berkshire,	1912,	A. I. Dean,	Sept. 10, 1912	April 21	Dec. 10
Florida,	Berkshire,	1912,	E. H. Stricker,	Sept. 10, 1912	June 12	Dec. 10
Florida,	Berkshire,	1912,	S. C. Neff,	Sept. 10, 1912	Sept. 10	Dec. 10
Florida,	Berkshire,	1912,	A. L. Ford,	Sept. 10, 1912	Sept. 18	Dec. 10
Florida,	Berkshire,	1913,	R. H. Houston,	Aug. 27, 1913	Sept. 2	Dec. 31
Gardner,	Worcester,	Surfacing,	E. M. Briggs,	July 1, 1913	Sept. 9	Nov. 7
Gay Head,	Dukes,	1913,	C. R. Mosher,	Oct. 1, 1913	Oct. 24	Dec. 31
Gill,	Franklin,	1912,	E. R. Hyde,	May 21, 1912	April 16	June 27
Grafton,	Worcester,	1913,	C. A. Walton,	May 12, 1913	June 4	June 28
Grafton,	Worcester,	1913,	Samuel Hobbs,	May 12, 1913	June 29	Aug. 30
Grafton,	Worcester,	1913,	E. H. Smith,	May 12, 1913	Aug. 31	Dec. 31
Granby,	Hampshire,	1913,	Carl W. Stiel,	April 1, 1913	April 7	May 30
Granby,	Hampshire,	1913,	G. N. Willis,	April 1, 1913	May 31	Sept. 29
Great Barrington,	Berkshire,	Surfacing,	W. R. Glidden,	Nov. 12, 1912	April 13	April 28
Great Barrington,	Berkshire,	Surfacing,	W. M. Stoddet,	Nov. 12, 1912	April 28	July 8
Hingham,	Plymouth,	1912,	C. A. Walton,	Aug. 6, 1912	April 16	April 23
Holliston,	Middlesex,	1912,	E. O. Knight,	Sept. 10, 1913	Mar. 31	June 21
Holyoke,	Hampden,	Surfacing,	M. Buement,	Aug. 6, 1913	Sept. 10	Nov. 28
Lanesborough,	Berkshire,	1913,	A. E. Page,	Oct. 28, 1913	Aug. 25	Nov. 6
Lee,	Berkshire,	1913,	A. E. Page,	Oct. 28, 1913	Sept. 18	Dec. 31
Lee,	Berkshire,	1913,	J. H. Phipps,	Oct. 28, 1913	Nov. 16	Dec. 15
Littleton,	Middlesex,	1913,	M. V. Fisher,	July 2, 1912	April 1	July 17
Littleton,	Middlesex,	1913,	M. V. Fisher,	April 16, 1913	April 21	Nov. 3
Linnoln,	Middlesex,	1913,	May 21, 1913	May 22	Nov. 1	Nov. 1
Lunenburg,	Worcester,	1913,	April 1, 1913	April 1	July 8	Sept. 23
Lunenburg,	Worcester,	1913,	L. R. Sewell,	April 1, 1913	June 26	Dec. 20
Marborough,	Middlesex,	1911,	C. A. Walton,	Oct. 18, 1911	May 6	Aug. 26
Mashpee,	Barnstable,	1913,	G. R. Jenkinson,	April 22, 1913	June 21	Aug. 6
Mashpee,	Barnstable,	1913,	R. W. Allen,	April 22, 1913	Aug. 7	Nov. 30

TABLE SHOWING TOWNS AND CITIES IN WHICH WORK HAS BEEN DONE, ETC. — *Concluded.*

TOWN OR CITY.	County.	Layout.	Resident Engineer.	Date of Contract.	Date of Beginning.	Date of Ending.
Methuen.	Essex.	1912.	R. W. Coburn,	Sept. 18, 1912	Jan. 1	Dec. 22
Methuen.	Essex.	1912.	F. McAvoy,	Sept. 18, 1912	Jan. 1	Dec. 22
Methuen.	Essex.	1912.	J. E. Troy,	Sept. 18, 1912	Mar. 31	Dec. 22
Middleton.	Essex.	1912.	L. P. Henderson,	Sept. 17, 1912	May 17	June 14
Middleton.	Essex.	1912.	J. E. Lawrence,	Sept. 17, 1912	June 15	June 28
Middleton.	Essex.	1913.	L. P. Henderson,	Sept. 2, 1913	Sept. 29	Dec. 30
Needham.	Norfolk.	Surfacing,	H. C. Heath,	April 29, 1913	April 30	May 2
North Adams.	Berkshire.	1913.	W. G. Burns,	July 30, 1913	Aug. 9	Dec. 10
North Adams.	Berkshire.	1913.	E. J. Dahill,	July 30, 1913	Aug. 9	Dec. 10
North Adams.	Berkshire.	1913.	R. H. Hosford,	July 30, 1913	Aug. 9	Dec. 10
North Adams.	Berkshire.	1913.	H. S. Jewell,	July 30, 1913	Aug. 9	Dec. 10
Northampton.	Hampshire.	1912.	J. J. Tobin,	Oct. 1, 1912	Oct. 1	Jan. 12
Northampton.	Hampshire.	1912.	C. M. Damon,	Oct. 1, 1912	April 7	July 19
North Andover.	Hampshire.	1912.	E. O. Knight,	Oct. 1, 1912	July 20	Nov. 22
Northbridge.	Worcester.	1913.	S. C. Foster,	May 13, 1913	May 28	Nov. 29
Northfield.	Franklin.	1913.	C. A. Welton,	Sept. 25, 1913	Oct. 7	Dec. 31
Northfield.	Franklin.	1912.	E. R. Hyde,	May 21, 1912	April 16	June 27
Morton.	Essex.	1912.	E. R. Hyde,	Oct. 9, 1912	April 1	July 15
Orange.	Bristol.	Chapter 525,	W. M. Stodder,	Sept. 17, 1912	Jan. 18	April 19
Oxford.	Franklin.	Surfacing,	E. R. Hyde,	July 1, 1913	July 5	Sept. 5
Pittsfield.	Worcester.	1913.	A. C. Lingley,	Aug. 5, 1913	Aug. 13	Dec. 3
Plymouth.	Berkshire.	1913.	J. R. Wolf,	May 13, 1913	May 30	Nov. 29
Provincetown.	Plymouth.	1913.	A. H. Briggs,	Aug. 12, 1913	Aug. 17	Dec. 13
Raynham.	Barnstable.	Surfacing,	W. P. Hammersley,	July 15, 1913	Oct. 18	Nov. 22
Rehoboth.	Bristol.	1913.	M. D. Gill,	Aug. 27, 1912	Sept. 10	Dec. 31
Rehoboth.	Bristol.	1912.	H. O. Parker,	Sept. 24, 1912	April 1	Aug. 23
Revere.	Suffolk.	1913.	I. G. Humphries,	Sept. 12, 1912	June 15	July 19
Revere.	Suffolk.	1913.	C. H. Restall,	June 24, 1913	Aug. 22	Dec. 31
Salisbury.	Essex.	1912.	J. E. Lawrence,	Nov. 27, 1912	Jan. 1	Nov. 29
Salisbury.	Essex.	1912.	Reuben Barker,	Nov. 27, 1912	Feb. 30	July 12
Salisbury.	Essex.	1913.	L. P. Henderson,	Sept. 3, 1913	Sept. 23	Nov. 29
Sandwich.	Barnstable.	1913.	C. R. Mosher,	June 3, 1913	June 9	Oct. 18
Sandwich.	Barnstable.	1913.	L. L. Brown,	April 29, 1913	Oct. 19	Dec. 1
Seekonk.	Bristol.	1913.	M. L. Humphries,	April 29, 1913	July 2	Aug. 2
Seekonk.	Bristol.	1913.	H. O. Parker,	May 21, 1913	Aug. 3	Sept. 22
Seekonk.	Bristol.	Surfacing,	H. O. Parker,	May 21, 1913	June 3	Aug. 23

APPENDIX G.

SHOWING CONTRACT PRICES ON

TOWN OR CITY.	Contract Number.	Contractor.	BITUMINOUS SURFACING.		EXCAVATION.			Portland Cement crete Masonry.
			Oil (Square Yard).	Tar (Square Yard).	All Kinds (Cubic Yard).	Borrow (Cubic Yard).	Ledge (Cubic Yard).	
Abington,	1584	Town of Abington,	-	\$0 30	\$0 60	\$0 70	\$2 00	\$9 50
Acton,	1546	Richmond F. Hudson,	\$0 12	-	60	60	2 00	10 00
Acton-Concord,	1599	John J. Martin,	06	-	60	70	2 00	10 00
Amherst,	1557	The Lane Construction Company,	-	-	1 00	80	2 00	12 00
Athol,	1614	Richmond F. Hudson,	-	12	60	⁵¹ 00	2 00	10 00
Ayer-Shirley,	1592	Harvey W. Tarbell,	-	-	55	70	2 50	18 00
Ayer-Shirley,	1596	T. J. Quinn,	-	¹¹³ 50	50	75	1 75	10 00
Becket,	1580	Town of Becket,	¹³⁰⁸	-	70	-	3 00	12 00
Berkley,	1606	Town of Berkley,	¹¹¹ ¹ / ₂	-	59	⁸⁴ ³ / ₄	³ 50	10 00
Blackstone,	1597	Richmond F. Hudson,	-	15	60	75	2 00	12 00
Bourne,	1508	Herbert L. Thomas,	¹⁶³⁸	-	45	50	2 00	10 00
Brookfield, Warren and Windsor,	1577	R. L. Whipple & Co.,	-	-	-	-	-	20 00
Buckland,	1545	-	-	-	-	-	-	-
Charlemont,	1621	Town of Charlemont,	²⁰	-	-	-	-	-
Charlton,	1551	Town of Charlton,	-	-	60	-	2 00	10 00
Cheshire,	1589	Town of Cheshire,	-	¹³¹⁵	70	90	2 00	-
Cheshire,	1618	Cordner & Montague,	-	¹³¹⁵	70	90	-	²²² 20
Chicopee,	1561	Birne, Adams & Buxton Construction Company,	²³¹ 19	-	-	-	-	-
Chilmark-Gay Head,	1616	Hamlin & Nelson,	07	²³⁶⁵	58	60	3 00	16 00
Cummington,	1595	R. L. Whipple & Co.,	-	-	²⁶¹ 50	80	¹²¹⁸ 00	10 00
Dartmouth,	1567	Thomas Whelan & Co.,	-	03	90	-	-	-
Dedham,	1598	Walter Cressy,	²⁷²¹	-	70	-	2 50	14 00
Deerfield,	1568	The Lane Construction Company,	-	10	1 00	-	-	²⁸⁰²
Easthampton,	1573	Town of Easthampton,	-	05	50	50	1 50	10 00
Florida-Savoy,	1602	E. R. Hyde,	¹²²² 00	¹¹³ 00	²⁶² 00	70	3 00	⁹²⁰ 00
Gardner,	1578	Richmond F. Hudson,	12	-	75	-	-	¹⁴¹ 25
Grafton,	1562	The Horne-Lowe Con- tracting Company,	-	¹³⁰⁸	66	80	2 00	9 75
Granby,	1547	The Horne-Lowe Con- tracting Company,	¹³¹⁰	¹⁴¹ 10	54	75	2 00	¹⁵ 00
Hingham-Weymouth,	1553	John Cashman & Sons Company,	-	25	-	-	-	-
Holyoke,	1612	The Lane Construction Company,	²⁹¹⁸ ¹ / ₂	¹³¹² ¹ / ₂	65	¹⁴¹ 50	¹³¹ 50	²⁸⁰³
Lanesborough,	1590	Cordner & Montague,	-	¹³¹⁵	70	-	-	³⁰¹ 25
Lee,	1617	Town of Lee,	-	¹³⁰⁸	70	¹⁴¹ 25	2 50	12 00
Lee,	1620	Town of Lee,	-	¹³⁰⁷	70	¹⁴¹ 25	2 00	¹² 00
Lincoln,	1567	John A. Gaffey,	-	-	³⁵⁴⁵⁰	-	-	-
Littleton,	1554	Burpee Blackney,	12	-	55	55	2 00	10 00
Lunenburg,	1548	Richmond F. Hudson,	¹² ¹ / ₂	-	70	-	-	-
Lunenburg,	1549	Richmond F. Hudson,	14	-	60	60	2 00	10 00
Mashpee,	1555	Antonio Carchia,	¹⁶³⁵	-	55	¹⁷¹ 35	2 50	12 00
Middleton,	1605	The Michael McDonough Company,	-	20	50	80	2 00	10 00

¹ Fifteen-inch iron pipe.² Screened gravel.³ Ten-inch clay pipe.⁴ Corrugated iron pipe.⁵ Sand borrow.⁶ Twenty-inch corrugated iron pipe.⁷ Fourteen-inch corrugated iron pipe.⁸ Sixteen-inch corrugated iron pipe.⁹ Portland cement concrete 1, 2 ¹/₂, 5.¹⁰ Fifteen-inch clay pipe.¹¹ Boulder concrete.¹² Portland cement concrete 1, 2, 4.¹³ Per gallon.¹⁴ Sand binder.¹⁵ Cobble stone gutters.¹⁶ Sand and oil mixture.¹⁷ Hardening subgrade.¹⁸ Eight-inch clay pipe.

APPENDIX G.

STATE HIGHWAYS DURING 1913.

BROKEN STONE.		PIPE CULVERTS (PER LINEAL FOOT).						Fencing (Lineal Foot).	Side Drains (Lineal Foot).	Stone Filling for Under-drains (per Cubic Yard).	Bounds (Each).	Catch-basins (Each).
Local (Ton).	Trap (Ton).	CLAY.			IRON.							
		Twelve-inch.	Eighteen-inch.	Twenty-four-inch.	Twelve-inch.	Eighteen-inch.	Twenty-four-inch.					
\$1 75	-	-	-	-	-	1\$1 25	-	\$0 30	-	-	\$2 00	-
1 60	2\$1 25	\$0 70	-	-	-	-	-	30	-	-	2 00	\$30 00
1 80	21 25	80	\$1 25	3\$0 75	-	-	-	30	-	-	2 00	25 00
-	2 25	41 50	-	-	-	-	-	30	-	-	2 00	-
2 00	2 75	-	62 50	-	4\$1 25	71 50	8\$1 60	30	-	\$1 50	2 00	30 00
924 00	2 20	90	1 40	101 00	-	-	-	35	-	-	2 00	-
128 00	2 10	1 00	1 75	101 50	-	-	-	35	-	-	2 00	-
1 80	141 25	-	-	-	41 25	41 75	42 25	35	-	1 25	2 50	-
1 59	-	75	-	-	-	-	-	33	-	1 15	2 00	-
151 00	2 30	75	101 00	2 50	370	918 00	1220 00	30	-	-	2 00	30 00
1775	-	1860	375	-	191 75	-	-	30	-	-	2 00	30 00
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
1 60	-	75	-	213 00	-	-	-	30	-	1 00	2 00	-
141 25	2 10	-	-	-	-	41 40	-	35	-	1 25	2 00	-
141 25	2 10	-	-	-	-	-	-	35	-	1 25	2 00	-
242 44	-	-	-	-	-	-	-	-	-	-	-	-
1 90	1465	95	1865	375	2 50	101 45	-	30	17\$0 65	95	3 50	38 00
918 00	-	-	-	-	-	-	-	-	-	-	-	-
141 10	2 60	-	-	-	-	-	-	-	-	1 00	-	-
21 50	1 75	75	1 80	-	-	-	-	35	-	-	2 25	-
2902	2 60	-	-	-	-	-	-	-	-	-	-	-
1490	2 00	3090	311 10	-	-	-	-	25	-	1 00	2 00	-
3250	332 00	-	-	-	-	-	-	20	-	-	3 00	-
341 50	2 35	-	-	-	-	-	-	-	-	1 00	-	-
1 69	21 25	85	370	101 20	-	-	-	32	-	1 12	2 25	35 00
3085	2 97	-	-	-	41 10	41 50	-	33	-	1 38	2 00	-
-	-	-	-	-	-	-	-	-	-	-	-	-
2 15	341 50	-	-	-	-	-	-	-	-	1 25	-	-
222 20	2 00	-	-	-	-	-	-	-	-	1 25	2 00	-
1 80	-	-	-	-	41 25	41 75	42 25	35	-	1 25	2 50	-
1 70	-	-	-	-	41 25	41 75	42 25	30	-	1 15	2 00	-
-	-	-	-	-	-	-	-	-	-	-	-	-
21 15	1 75	70	360	101 10	-	-	-	30	-	-	2 00	-
1 75	-	-	-	-	-	-	-	-	-	-	-	-
1 60	-	-	-	-	2 00	363 00	-	30	-	-	2 00	-
-	-	1555	-	-	-	-	-	35	-	-	2 50	40 00
1 40	-	350	-	-	-	-	-	30	-	-	1 00	40 00

¹⁹ Ten-inch iron pipe.²⁰ Actual cost.²¹ Thirty-inch clay pipe.²² Pea stone.²³ Laying and furnishing Warrenite.²⁴ Warrenite surfacing.²⁵ Clay for surfacing sand clay road.²⁶ Bridge excavation.²⁷ Bermudez.²⁸ Scarifying and reshaping broken stone.²⁹ Applying bituminous material.³⁰ Gravel per cubic yard.³¹ Rip-rap.³² Waterproofing concrete.³³ Rock embankment.³⁴ Broken stone screened and replaced.³⁵ Lump sum.³⁶ Sixteen-inch iron pipe.

SHOWING CONTRACT PRICES ON

TOWN OR CITY.	Contract Number.	Contractor.	BITUMINOUS SURFACING.		EXCAVATION.			Con- crete Masonry.
			Oil (Square Yard).	Tar (Square Yard).	All Kinds (Cubic Yard).	Borrow (Cubic Yard).	Ledge (Cubic Yard).	
Needham,	1558	Town of Needham,	-	\$0 03	-	-	-	-
North Adams,	1586	W. F. Davis,	\$1 50	12	\$0 54	\$0 70	\$1 65	\$7 50
North Andover,	1563	David J. Sheehan Com- pany,	-	.979	45	60	2 00	9 00
Northbridge,	1615	Luigi C. Carchia,	121 00	25	50	80	3 00	10 00
Orange,	1579	Richmond F. Hudson,	12	-	75	-	-	-
Oxford,	1587	New England Contracting Company,	-	1507½	60	70	2 50	10 00
Pittsfield,	1564	Olin T. Benedict,	161 25	1708	70	1 00	2 00	12 00
Plymouth,	1593	P. F. Giovannini,	2230	-	45	55	-	12 00
Provincetown,	1581	Chas. W. Snow,	-	-	-	-	-	-
Raynham,	1603	W. W. Witham Company,	-	.1825	48	60	2 00	8 00
Revere,	1575	P. Rossetti & Sons,	-	-	-	-	-	10 00
Revere,	1594	A. G. Tomasello,	231 25	30	60	72	1 00	8 50
Salisbury,	1607	Town of Salisbury,	15	121 25	60	85	2 00	10 00
Sandwich,	1572	The Lane Quarry Com- pany,	2238	-	50	50	-	12 00
Seekonk,	1559	Thomas J. Quinn,	15	-	60	70	1 00	10 00
Seekonk,	1570	H. E. Cushing,	-	02½	75	1280	-	-
Sheffield,	1591	Town of Sheffield,	-	-	60	31 25	2 00	11 00
Sterling,	1581	Town of Sterling,	-	-	60	60	2 00	10 00
Sunderland,	1556	Town of Sunderland,	351 00	1070	50	60	2 00	10 00
Taunton,	1553	Zebulon L. Canedy,	11½	-	59	84	2 50	10 00
Taunton,	1600	Herbert E. Cushing,	-	24	70	80	2 00	12 00
Taunton,	1610	The Horne-Lowe Con- tracting Company,	11½	-	59	84	2 00	10 00
Townsend,	1576	David H. Damon,	-	-	60	-	-	-
Ware-West Brookfield,	1588	Framingham Contracting Company,	-	-	45	60	1 75	10 00
Wareham,	1601	William H. Ellis,	103 75	75	3575	75	1 75	4011 75
West Boylston,	1582	P. F. Giovannini,	-	-	70	1080	2 00	10 00
Westminster,	1550	Richmond F. Hudson,	12	-	70	-	-	-
Weston,	1560	Coleman Bros.,	-	4543	-	-	-	-
Whately,	1574	The Lane Construction Company,	4610	02	60	1 00	-	-
Whitman,	1611	Town of Whitman,	-	30	50	60	2 00	10 00
Wilbraham,	1565	Cordner & Montague,	121 00	1510	75	60	2 00	10 00
Windsor,	1613	William R. Pratt,	65 00	4815 00	45	1 50	3 00	10 00
Woburn,	1583	City of Woburn,	-	20	60	60	2 00	10 00
Wrentham,	1566	Snow & Farrington,	05	-	55	70	1 00	9 00

1 Grubbing and clearing per acre.

2 Stock fence.

3 Rock slope.

4 Dry rubble masonry.

5 Sixteen-inch corrugated iron pipe.

6 Cement rubble masonry.

7 Corrugated iron pipe.

8 Rustic guard rail.

9 Concrete surfacing.

10 Gravel per cubic yard.

11 Cobble stone gutters.

12 Sand binder.

13 Curbstone inlets.

14 Ten-inch clay pipe.

15 Per gallon.

16 Excavation for bridge foundation.

17 Pea stone.

18 Ledge excavation in bridge foundation.

19 Eight-inch clay pipe.

20 Concrete for bridge.

21 Rock embankment.

22 Sand and oil mixture.

23 Fifteen-inch clay pipe.

24 Bulkhead.

STATE HIGHWAYS DURING 1913 — *Concluded.*

BROKEN STONE.		PIPE CULVERTS (PER LINEAL FOOT).						Fencing (Lineal Foot).	Side Drains (Lineal Foot).	Stone Filling for Under-drains (per Cubic Yard).	Bounds (Each).	Catch-basins (Each).
Local (Ton).	Trap (Ton).	CLAY.			IRON.							
		Twelve-inch.	Eighteen-inch.	Twenty-four-inch.	Twelve-inch.	Eighteen-inch.	Twenty-four-inch.					
381 50	486 00	581 50	6810 00	-	781 25	781 75	783 00	\$0 18	\$80 30	\$1 00	\$4 50	-
1065	111 00	75	1 25	-	-	2 00	-	30	-	-	2 00	\$35 00
1 60	1310 00	1 00	2 00	1480 80	-	-	-	30	-	1 25	2 00	35 00
-	2 35	-	-	-	-	-	-	-	-	-	-	-
101 00	2 40	75	1 45	-	-	-	-	35	-	1 00	2 00	-
183 00	2 50	1975	2016 00	121 50	71 50	212 00	-	40	-	2 00	2 50	-
213 00	-	85	2 00	231 15	1970	-	-	30	-	-	2 50	40 00
-	-	243 00	253 00	-	-	-	-	-	-	-	-	-
1 85	-	65	1950	231 40	-	-	-	35	-	85	1 50	30 00
292 40	-	-	1 30	-	-	-	-	-	30	2720	2 00	25 00
-	1 40	75	2900	-	-	-	3 50	30	-	-	4 00	30 00
101 00	2 05	75	1465	-	-	-	-	30	-	-	2 00	30 00
-	-	85	1955	231 00	291 25	301 75	-	35	-	-	2 50	35 00
1 95	-	1 00	-	-	-	-	-	35	-	1 40	2 00	-
311 65	321 00	-	-	-	-	-	-	-	-	1 00	-	-
-	211 00	-	-	-	71 45	71 75	-	30	-	90	2 00	-
1 85	274 00	1465	1 50	341 00	363 00	51 40	371 75	30	-	1310 00	2 00	34 00
2012 00	2 25	-	-	-	2 25	392 00	-	30	-	-	2 00	-
1 59	-	231 31	-	-	-	-	-	33	-	1 15	2 00	35 00
1 75	-	1 10	1980	-	-	-	-	35	-	1 00	2 00	35 00
1 59	-	231 31	-	-	2 25	392 00	-	33	-	1 15	2 00	35 00
-	312 05	-	-	-	-	-	-	-	-	-	-	-
-	331 10	51 25	383 40	394 90	71 05	71 40	-	30	-	-	-	-
4111 75	1 75	426 75	3575	212 75	436 75	4475	-	75	-	-	2 75	-
-	1 90	90	1480	-	-	-	-	33	-	-	2 40	35 00
-	2 35	-	-	-	-	-	-	-	-	1 00	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
471 50	2 45	-	-	-	-	-	-	-	-	-	-	-
1 65	-	1 00	231 15	-	291 50	-	-	30	-	1 05	2 00	30 00
111 00	2 00	70	1 50	2 45	2 00	231 12	-	30	-	-	1 80	30 00
1 50	351 00	-	-	-	71 20	71 55	72 00	29	-	1 50	2 00	-
341 25	2 05	75	1465	-	-	-	-	30	-	-	2 00	30 00
-	331 00	1970	1480	-	-	-	-	30	-	90	2 00	30 00

25 Jetty.

26 Granite block pavement.

27 Extension of side drains.

28 Rip-rap.

29 Eight-inch.

30 Ten-inch iron pipe.

31 Scarifying and reshaping broken stone.

32 Broken stone in bins.

33 Gravel for surfacing.

34 Screened gravel.

35 Bridge excavation.

36 Sixteen-inch iron pipe.

37 Twenty-inch corrugated iron pipe.

38 Thirty-six-inch corrugated iron pipe.

39 Forty-eight-inch corrugated iron pipe.

40 Portland cement concrete 1, 2½, 5.

41 Portland cement concrete 1, 2, 4.

42 Boulder concrete.

43 Piles driven in place.

44 Granite curb.

45 Bermudez.

46 Applying bituminous material.

47 Broken stone screened and replaced.

48 Bridge concrete.

APPENDIX H.

STATEMENT OF CLAIMS AGAINST THE COMMISSION.

[As required by section 5, chapter 18 of the Revised Laws.]

NAME.	Residence.	Nature of Claim.
Coleman, Martin W., .	Richmond, .	Damages due to construction of State highway in Richmond.
Connelly, William H., .	Lanesborough, .	Damages due to construction of State highway in Lanesborough.
Flagg, Lucretia T., .	Northampton, .	Damages due to construction of State highway in Northampton.
Huntington, Herbert R.,	Marlborough, .	Damages due to construction of State highway in Marlborough.
Hurd, Arno E., . .	Westminster, .	Damages due to accident alleged to have occurred on State highway in Westminster.
Kinmond, John D., .	Boston, . .	Damages due to accident alleged to have occurred on State highway in Salisbury.
Mower, Clara I., . .	North Woburn, .	Damages due to construction of State highway in Woburn.
Nash, Harlan E., . .	South Hadley, .	Damages due to construction of State highway in South Hadley.
Nourse, Joseph P., .	Marlborough, .	Damages due to construction of State highway in Marlborough.
Reed, William H., . .	Gloucester, . .	Damages due to accident alleged to have occurred on State highway in Gloucester.
Rogerson, Sophia, . .	Lanesborough, .	Damages due to construction of State highway in Lanesborough.
Stevens, John A., and Priscilla.	Lanesborough, .	Damages due to construction of State highway in Lanesborough.
Taft, Kate P., . . .	Northampton, .	Damages due to construction of State highway in Northampton.

APPENDIX I.

MAINTENANCE.

Table showing the Amounts expended for Repair and Maintenance, the Cost per Mile for Maintenance during 1913, the Cost per Mile per Year on Each Road, the Number of Miles under Maintenance and the Amounts to be assessed upon Municipalities for Maintenance under Chapter 47 of the Revised Laws.

TOWN OR CITY.	AMOUNTS EXPENDED.					Total ex- pended.	EXPENDED PER MILE IN 1913.		Length under Mainte- nance. (Miles).	Cost per Mile per Year.	Amount to be assessed on Cities and Towns.
	REVENUE APPROPRIATION.		MOTOR VEHICLE FEES FUND.		From Revenue Appro- priation.		From Motor Vehicle Fees Fund.				
	To 1913.	During 1913.	Total.	Total.							
Abington.	\$2,138 67	\$242 57	\$2,431 24	\$4,529 65	\$7,901 13	\$56 15	\$317 65	\$273 80	\$238 42	\$108 44	
Acton.	4,908 95	956 74	5,865 69	3,172 88	9,469 85	133 07	59 98	193 05	148 63	430 36	
Acushnet.	5,677 24	53 91	5,731 15	2,769 34	9,976 73	15 81	432 91	448 72	242 27	26 89	
Adams.	4,655 13	468 90	5,124 03	1,33 53	1,649 78	138 53	68 24	299 23	408 06	153 61	
Agawam.	2,639 53	1,780 64	4,420 17	9,300 47	75 37	9,465 84	18 89	465 17	575 94	486 36	
Amherst.	4,422 50	485 82	4,908 32	228 88	5,137 65	147 22	147 36	147 36	174 51	224 73	
Amherbury.	1,401 39	131 16	1,532 55	1,963 39	3,495 94	74 10	244 44	318 54	291 09	37 47	
Andover.	12,951 84	1,397 25	14,349 09	9,699 90	35,613 45	333 47	2,760 01	3,093 48	612 86	353 00	
Ashburnham.		169 33	169 33		169 33	252 73		252 73	222 80	33 14	
Ashby.	10,230 98	674 28	10,955 26	1,545 10	13,301 61	132 47	157 42	289 89	219 50	246 63	
Ashfield.	3,569 97	209 73	3,779 70		4,038 81	130 27		130 27	106 41	97 07	
Ashland.	1,290 14	656 90	1,956 04	487 26	2,443 76	205 28	13 89	219 17	129 23	280 31	
Athol.	10,590 84	563 80	11,154 64	9,829 24	21,207 88	181 57	72 26	254 13	534 88	219 87	
Attleborough.	5,612 75	288 17	6,000 92	8,911 54	21,960 12	114 50	2,078 96	2,193 46	633 77	151 78	
Auburn.	24,881 55	2,516 05	27,399 60	11,991 53	42,390 98	476 34	563 15	1,044 49	606 19	586 10	
Ayer.		2 23	2 23		2 23	18 58		18 58	64	93	
Barnstable.	7,763 09	711 32	8,474 41	5,684 55	21,121 87	63 85	625 04	688 89	251 12	330 92	
Barnes.	10,410 98	538 01	11,248 99	320 02	11,568 61	289 97		289 97	311 74	2 89	
Becket.	6,093 96	4,036 15	10,130 11	9,578 63	20,669 83	535 30	127 47	662 77	600 87	7 54	

Table showing the Amounts expended for Repair, Maintenance, etc. — Continued.

TOWN OR CITY.	AMOUNTS EXPENDED.					Total expended.	EXPENDED PER MILE IN 1913.				Cost per Mile under Maintenance per Year.	Length under Maintenance (Miles).	Amount to be assessed on Cities and Towns.
	REVENUE APPROPRIATION.			MOTOR VEHICLE FEES FUND.			From Revenue Appropriation.	From Motor Vehicle Fees Fund.	Total.				
	To 1913.		Total.	During 1913.	Total.								
	To 1913.	During 1913.											
Bedford,	\$1,580 91	\$191 26	\$1,772 17	\$196 12	\$3,963 24	\$5,735 41	\$115 92	\$118 86	\$234 78	\$315 13	1.65	\$66 31	
Belchertown,	1,470 95	291 29	1,762 25	199 77	212 44	1,974 69	123 95	85 01	208 96	89 47	2.35	113 67	
Bellingham,	1,303 89	145 81	1,449 70	60 00	3,578 26	5,027 96	45 85	18 87	64 72	198 26	3.18	67 58	
Berkley,	343 58	140 27	483 85	—	33 00	516 85	182 17	—	182 17	95 89	.77	60 46	
Bernardston,	1,013 34	299 15	1,312 49	1,172 80	1,172 80	2,485 29	110 80	434 37	545 17	394 49	2.70	139 32	
Beverly,	20,829 68	1,905 62	22,735 30	33,207 26	59,066 92	82,401 72	346 06	5,946 35	6,192 41	1,306 92	5.68	568 04	
Billerica,	645 97	180 58	826 55	5 00	474 14	1,300 69	311 34	8 62	319 96	508 08	.58	43 22	
Blackstone,	2,756 85	529 88	3,286 73	765 85	4,191 91	5,442 04	203 02	103 63	170 83	263 49	7.39	242 24	
Bourne,	5,420 90	496 59	5,917 49	713 93	7,897 78	13,815 27	67 20	103 63	170 83	263 49	7.39	242 24	
Boston,	2,412 64	1,144 90	3,557 54	922 42	4,101 35	4,567 89	817 79	658 87	1,476 66	739 14	1.40	432 96	
Boxborough,	2,997 96	432 88	3,430 84	3,164 74	4,457 79	7,888 63	130 78	956 11	1,086 89	234 57	3.31	179 79	
Braintree,	2,138 02	159 01	2,297 03	300 76	3,039 45	5,337 48	150 01	283 74	433 75	432 18	1.06	73 27	
Brewster,	9,153 56	896 66	10,050 22	2,120 07	3,529 50	13,579 72	114 66	271 11	385 77	126 88	7.82	293 90	
Bridgewater,	4,207 96	96 92	4,304 88	534 99	1,667 36	5,972 24	27 93	154 18	182 11	215 37	3.47	51 30	
Brimfield,	3,130 09	600 32	3,730 41	683 91	6,831 90	10,562 31	151 21	—	151 21	200 95	3.97	179 78	
Brookton,	4,065 55	243 41	4,308 96	628 78	7,758 01	12,066 97	76 30	197 11	273 41	287 65	3.19	107 47	
Brookfield,	8,780 74	1,522 98	10,303 72	1,160 15	2,332 68	12,636 40	328 94	250 57	579 51	290 09	4.63	374 22	
Buckland,	7,941 24	742 98	8,684 22	146 70	4,736 39	13,470 61	172 79	34 12	206 91	227 85	4.30	252 21	
Burlington,	4,136 55	883 40	5,019 95	23 20	2,354 54	7,374 49	232 47	6 11	238 58	225 58	3.80	274 09	
Canton,	4,046 88	168 15	4,215 03	3,704 14	6,367 83	10,582 86	52 06	1,146 79	1,198 85	504 90	3.23	80 69	
Charlenton,	5,165 71	170 37	5,336 08	278 12	278 12	5,614 20	215 66	352 05	567 71	478 21	.79	39 41	
Charlton,	3,698 76	1,904 20	5,602 96	48 93	210 53	5,813 49	240 43	20 40	260 83	151 27	7.92	676 68	
Chatham,	4,537 25	424 73	4,961 98	4,587 26	5,936 06	10,948 04	59 24	639 79	699 03	189 31	7.17	208 33	
Chathamfield,	4,360 64	1,103 56	5,464 20	5,389 58	5,664 92	11,129 12	177 71	12 62	190 33	255 31	6.21	468 37	
Chelsea,	2,541 37	348 37	2,889 74	8,686 81	10,437 69	33,267 81	362 88	1,823 80	2,186 68	1,372 54	.96	144 73	
Cheshire,	8,126 50	871 99	8,998 49	65 52	4,493 69	9,492 18	208 11	102 19	310 30	255 85	4.19	256 58	
Chester,	6,871 82	1,973 94	8,845 76	756 54	1,614 73	10,460 49	298 18	114 28	412 48	238 71	6.62	524 08	
Chicopee,	16,948 70	3,597 43	20,546 13	21,695 05	37,847 32	58,393 45	924 79	5,677 13	6,601 92	1,642 11	3.89	749 51	
Chilmark,	1,306 72	200 08	1,506 80	35 00	3,123 34	4,630 14	32 69	504 63	537 32	144 96	6.12	107 09	
Clarksburg,	2,463 22	535 99	3,004 21	185 62	196 08	3,200 29	491 73	170 29	662 02	468 56	1.09	86 29	
Colhasset,	4,071 00	192 08	4,263 08	1,269 46	4,071 49	8,334 57	84 25	556 78	641 03	278 65	2.28	91 88	
Colrain,	2,777 88	146 43	2,924 31	75 84	150 18	3,074 49	68 75	35 61	104 36	116 27	2.13	74 78	
Concord,	10,912 91	991 05	11,903 96	2,630 06	3,045 00	14,948 96	276 06	115 58	391 64	364 52	3.59	279 19	
Dalton,	7,440 91	1,243 25	8,684 16	3,006 34	3,006 34	11,690 50	485 64	1,174 35	1,659 99	323 66	2.56	242 26	

Dartmouth,	6,252 92	187 74	6,440 66	13,772 39	14,180 03	27,952 42	34,393 08	3,166 70	672 92	4 53	93 29
Dedham,	24 38	5 75	30 13	1 93	12 75	14 68	44 81	3,425 00	344 69	1 03	2 40
Deerfield,	8,486 48	2,486 33	13,072 81	10,170 81	13,193 22	23,363 33	36,436 34	1,682 81	496 35	7 84	747 53
Dennis,	10,320 37	2,656 90	13,977 36	12,606 88	13,139 62	5,746 51	14,723 87	1,999 94	142 96	7 50	306 62
Dighton,	2,564 22	357 54	2,921 76	3,864 34	1,920 38	5,064 72	8,006 38	234 69	286 67	5 20	179 55
Douglas,	1,559 68	540 65	2,099 73	3,996 26	367 25	6,363 31	8,463 24	172 42	426 25	2 13	231 25
Dover,	1,692 54	196 69	1,889 43	1 76	456 28	458 04	2,377 47	223 06	313 38	172 78	79 39
Dracut,	817 23	157 95	975 18	55	-	55	975 73	-	86 31	1 83	80 28
Dudley,	2,365 18	1,510 55	4,475 73	6,446 55	159 05	6,605 60	11,081 33	69 45	607 53	2 29	295 79
Duxbury,	8,038 91	369 65	8,408 56	1,129 79	766 75	1,896 54	10,305 10	148 59	80 71	5 16	180 92
East Longmeadow,	999 92	431 07	1,430 99	1,760 64	4 61	4 61	10,305 10	2 56	126 04	1 80	135 00
Eastham,	3,769 93	355 97	4,125 90	2,590 53	2,590 53	4,261 17	8,387 07	401 01	256 09	6 46	186 48
Easthampton,	3,824 78	679 59	4,503 78	328 75	302 22	630 97	5,134 75	280 82	405 70	2 42	151 41
Easton,	795 31	61 05	856 32	6,626 53	140 19	6,066 72	7,623 04	175 24	725 46	80	25 73
Edgartown,	3,859 23	19 75	3,878 98	680 86	129 85	8,010 71	4,089 69	53 66	61 82	2 42	8 39
Erving,	4,430 33	817 60	5,047 93	1,203 23	1,095 08	2,401 31	8,049 24	178 93	312 52	6 12	354 01
Essex,	3,421 85	56 60	3,478 45	623 02	135 42	758 44	4,236 89	92 75	111 04	1 46	23 65
Farhaven,	1,597 19	104 36	1,701 55	3,157 36	378 88	3,536 24	5,237 79	261 30	333 27	1 45	42 29
Falmouth,	13,187 76	1,384 62	14,572 38	16,042 71	3,608 82	19,651 53	34,223 91	231 93	330 92	15 56	683 98
Fitchburg,	8,073 94	679 44	8,753 38	15,126 14	2,595 85	17,721 99	26,475 37	680 06	794 96	4 12	241 09
Foxborough,	154 00	154 00	2,429 99	76 17	1,638 09	1,714 26	4,144 25	43 90	466 69	3 51	68 22
Framingham,	2,262 41	1,113 89	3,376 30	4,123 16	21 15	4,144 31	7,520 61	347 00	510 59	3 21	491 08
Freeport,	1,776 83	1,069 46	1,876 39	1,135 22	400 86	1,536 18	3,412 57	106 61	353 59	3 76	311 19
Freetown,	2,733 09	106 41	2,839 50	3,053 66	927 33	3,980 90	6,820 40	297 12	292 63	3 87	156 55
Gardner,	6,620 00	410 34	7,030 34	7,272 35	11,140 51	18,412 86	25,443 20	3,315 63	525 14	3 36	198 16
Gloucester,	20,890 79	1,645 40	22,536 19	9,545 53	1,922 01	11,929 20	19,310 58	74 38	487 80	3 98	510 02
Goshen,	6,384 50	996 88	7,381 38	5,849 14	66 16	5,915 30	11,868 19	405 24	524 32	2 46	288 40
Grafton,	3,172 37	780 82	3,952 89	5,942 91	70 78	173 15	7,262 78	229 45	422 36	3 69	331 44
Granby,	6,615 00	594 63	7,209 63	1,112 37	10,708 94	12,361 03	26,265 10	12 51	134 86	4 86	258 45
Great Barrington,	13,335 67	567 50	13,903 17	1,652 99	12,361 03	7,262 78	26,265 10	3,306 87	492 13	3 41	235 09
Greenfield,	2,663 76	637 08	3,300 84	3,877 92	1,169 48	5,047 40	8,348 24	218 19	337 05	5 36	287 57
Groton,	1,157 16	145 04	1,302 20	145 75	539 17	684 02	1,987 12	382 39	485 26	1 29	79 07
Groveland,	1,223 92	411 74	2,635 66	2,901 58	1 50	2,903 08	5,538 58	87	240 25	1 72	185 35
Hadley,	12,758 72	1,063 89	13,822 61	10,796 23	1,039 74	11,835 97	25,658 58	221 69	448 53	4 69	374 26
Hamilton,	4,905 49	643 05	5,553 54	3,737 03	1,183 34	2,560 37	8,113 91	243 63	688 49	3 40	340 34
Hancock,	22,635 26	3,091 78	25,627 04	7,927 81	32 50	7,960 31	31,587 35	10 06	673 36	3 23	181 64
Hanover,	1,285 94	52 92	1,338 16	23 00	645 69	668 69	2,006 85	349 02	377 25	1 85	22 15
Hardwick,	1,427 78	381 86	1,809 64	-	464 53	464 53	1,809 64	465 68	159 86	1 82	49 64
Harvard,	1,778 76	403 00	1,580 76	1,805 53	3,682 45	2,045 29	174 46	201 10	375 56	2 31	176 08
Harwich,	6,748 91	313 23	7,062 14	1,805 53	3,682 45	12,550 12	48 34	588 28	616 62	6 48	187 31
Hatfield,	2,848 37	1,161 43	4,009 80	937 90	516 25	1,454 15	5,463 95	145 83	473 92	3 71	497 85
Haverhill,	11,031 74	2,022 62	13,054 36	2,934 69	38 72	2,773 41	15,827 77	6 77	360 37	5 52	776 76
Hingham,	6,269 33	311 18	6,580 51	9,326 57	1,074 41	10,400 98	16,981 49	403 91	323 10	2 66	147 92
Hinsdale,	1,126 37	159 63	1,285 17	-	102 69	1,367 86	155 91	100 68	526 59	1 02	36 53
Holbrook,	1,366 97	108 73	1,475 72	340 30	3,091 69	3,451 99	4,907 71	1,766 68	1,828 82	1 75	55 98

Table showing the Amounts expended for Repair, Maintenance, etc. — Continued.

TOWN OR CITY.	AMOUNTS EXPENDED.				EXPENDED PER MILE IN 1913.				Length under Maintenance (Miles).	Amount to be assessed on Cities and Towns.		
	REVENUE APPROPRIATION.		MOTOR VEHICLE FEES FUND.		Total expended.	From Revenue Appropriation.		From Motor Vehicle Fees Fund.			Total.	Cost per Mile per Year.
	To 1913.	During 1913.	Total.	To 1913.		During 1913.	Total.					
Holden.	\$11,862 33	\$1,636 87	\$13,549 20	\$6,450 27	\$1,377 60	\$7,827 87	\$355 88	\$290 63	\$646 51	\$314 73	4.74	\$498 99
Holliston.	1,560 93	598 98	2,159 91	1,581 07	21 57	1,602 64	121 74	4 38	126 12	242 90	4.92	270 92
Holyoke.	2,907 74	1,299 40	4,037 14	5,166 90	19,469 31	24,635 90	271 43	4,680 12	4,951 61	2,030 66	4.16	129 11
Hudson.	866 62	1,720 49	1,036 82	42 25	392 12	434 37	149 30	343 96	483 26	191 81	1.14	80 07
Huntington.	8,437 23	2,221 49	9,658 72	3,617 83	62 45	3,680 28	540 48	27 63	568 11	508 34	2.26	178 92
Ipswich.	2,189 12	217 89	2,407 01	1,451 89	1,571 71	3,023 60	149 30	423 46	472 76	314 00	4.42	107 98
Kingston.	1,087 39	199 33	1,286 72	841 62	191 45	1,033 07	170 17	187 70	383 12	156 21	1.02	56 84
Lakeville.	2,655 50	298 98	2,954 48	1,612 89	1,422 60	3,035 49	35 76	170 17	205 93	124 48	8.36	129 46
Lancaster.	1,081 50	626 51	1,708 01	706 32	291 49	997 81	2,705 82	233 19	734 40	193 82	1.25	146 77
Lanesborough.	864 08	526 63	1,390 71	—	422 08	422 08	1,312 79	255 65	460 54	452 06	2.06	163 08
Lawrence.	3,607 59	289 83	3,897 42	162 31	7 50	169 81	4,067 23	1,073 44	777	922 27	.27	51 81
Lee.	20,651 40	2,513 32	23,164 72	4,988 11	1,067 35	6,055 46	29,250 18	420 38	596 80	452 64	6.05	616 11
Leicester.	27,588 16	3,880 77	31,468 93	19,469 43	7,090 87	27,130 30	796 87	1,573 07	2,369 94	763 70	4.87	907 35
Lenox.	34,598 27	6,879 50	41,477 37	31,150 63	1,814 49	32,965 09	74,442 86	2,306 88	1,134 99	1,240 48	7.66	1,470 75
Lexington.	2,240 16	765 07	3,005 23	3,530 93	439 30	970 23	3,975 46	350 94	201 51	162 13	2.18	287 16
Lincoln.	7,966 32	427 90	8,393 52	3,280 22	1,019 68	4,300 90	191 13	180 50	702 37	333 90	4.29	332 46
Littleton.	3,023 01	179 80	3,202 81	11,946 97	716 41	12,663 38	15,866 19	39 99	155 74	194 83	4.60	96 33
Lowell.	16,199 06	1,906 32	18,105 98	2,141 77	10 46	2,152 23	20,298 21	494 99	702 37	355 68	2.65	306 67
Lunenburg.	5,331 83	1,851 07	7,182 90	5,665 69	9,561 62	15,127 31	22,312 81	374 38	1,931 64	551 99	4.95	560 81
Lynn.	8,298 59	237 90	8,536 49	5,698 64	617 72	6,316 36	14,852 85	680 36	2,908 02	570 06	4.90	100 36
Mansfield.	918 24	55 83	974 07	16 21	523 33	539 54	1,513 61	48 14	478 04	132 30	1.21	100 36
Marion.	11,482 15	153 91	11,636 06	3,606 45	2,620 45	6,226 90	17,862 96	27 63	498 09	238 01	3.57	77 66
Marlborough.	13,078 02	3,603 56	17,681 58	6,807 02	180 66	6,987 68	24,074 26	531 45	269 69	357 98	6.79	687 53
Marshfield.	7,982 78	472 49	8,455 27	2,985 99	1,733 72	4,719 71	13,174 98	57 06	256 45	194 66	8.28	242 92
Mashpee.	14 34	16 02	30 36	—	66 48	66 48	96 84	5 07	26 11	26 03	3.16	6 68
Matapoisett.	4,842 36	222 40	5,064 76	7,276 04	1,522 42	8,798 46	13,863 22	69 28	474 27	306 84	3.21	93 63
Medford.	1,312 78	83 35	1,396 13	2,399 86	1,527 65	3,927 51	5,323 64	96 92	1,873 26	1,142 41	.86	58 32
Melrose.	429 63	135 72	565 35	4 69	9 75	14 44	579 79	339 30	363 68	204 85	4.42	58 32
Merrimac.	2,777 24	459 73	3,236 97	960 48	1 50	961 98	4,198 95	206 16	206 83	178 84	2.23	178 32
Methuen.	6,921 00	2,048 44	8,969 44	3,404 54	153 42	3,557 96	11,992 40	41 58	596 71	285 54	3.69	358 83
Middleborough.	6,394 24	736 91	7,131 15	11,193 66	2,410 82	13,604 48	21,355 66	59 19	193 64	163 76	12.45	410 70
Middleton.	—	41 88	41 88	—	—	—	41 88	—	68 66	167 52	6.61	17 45
Milford.	1,494 56	585 21	2,079 77	4,937 17	2 50	4,939 67	7,019 44	70	165 55	358 86	3.55	248 11

Millbury . . .	2,809 65	682 63	3,532 28	4,357 73	421 75	4,779 48	8,361 76	229 07	141 53	370 60	286 95	2 98	277 88
Milton . . .	5,874 41	55 48	5,929 89	5,722 24	1,059 86	1,432 10	7,361 99	63 77	1,218 23	1,282 00	656 73	1 87	23 44
Monong . . .	2,170 84	649 21	3,860 05	3,585 88	292 54	35 88	3,395 93	403 24	51 05	403 24	156 20	1 61	144 76
Monseig . . .	5,827 19	5,985 00	5,827 19	5,985 00	3,011 54	6,277 19	12,104 73	121 83	51 05	473 88	260 82	5 73	337 38
Nantucket . .	15,804 35	160 66	15,961 69	2,476 99	3,011 54	7,488 53	21,453 22	24 79	464 74	489 53	216 50	6 48	303 52
Natick . . .	3,559 35	32 21	3,585 89	7,807 33	492 79	7,839 33	13,525 43	664 54	10 07	674 61	412 99	3 20	303 52
Needham . . .	1,247 93	815 07	1,307 86	1,307 86	492 79	1,307 86	2,711 76	172 35	242 75	319 83	145 16	2 03	77 74
New Braintree .	331 29	68 94	400 23	400 23	775 96	7,986 27	400 23	172 35	242 75	319 83	145 16	2 03	77 74
Newbury . . .	8,924 51	441 33	9,365 84	7,210 31	775 96	7,986 27	17,352 11	104 33	183 44	287 77	383 55	4 23	214 05
Newburyport .	7,821 95	678 83	8,500 78	2,634 34	51 28	2,885 47	11,386 52	107 30	29 30	417 20	426 94	1 75	239 87
Newton . . .	723 27	814 79	8,018 79	2,437 75	248 16	1,818 91	2,633 70	88 85	240 93	329 78	211 54	1 03	41 72
Norfolk . . .	2,837 29	181 32	3,018 61	3,533 44	342 65	3,876 09	6,894 70	125 05	236 31	361 36	209 05	1 45	85 28
North Adams .	23,089 04	3,651 24	26,740 28	8,656 51	56 15	8,712 66	35,452 94	815 01	12 53	827 54	630 50	4 48	968 83
Northampton .	6,125 39	1,003 16	7,128 55	1,528 71	296 08	1,814 79	8,943 34	494 17	140 92	635 09	325 68	2 03	249 14
North Andover .	4,145 91	5,652 85	5,754 75	667 36	578 93	1,246 29	7,001 04	286 78	103 20	389 98	225 54	5 61	560 28
North Attleborough .	15,802 20	9,671 24	15,802 20	15,802 20	9,671 24	25,473 44	31,411 40	70 86	2,686 46	2,737 32	519 67	3 60	118 75
Northborough .	7,995 75	3,166 65	7,995 75	3,166 65	173 57	3,340 92	11,335 07	546 37	39 00	565 37	225 41	4 45	445 57
North Brookfield .	1,194 48	28 82	1,194 48	28 82	28 82	63 07	1,257 55	96 06	12 81	108 87	94 98	2 25	108 67
Northfield . .	1,833 83	211 77	1,833 83	211 77	211 77	211 77	2,047 60	86 48	88 24	176 72	157 38	2 40	108 45
Norton . . .	5,659 24	190 94	5,849 18	5,659 24	190 94	5,849 18	9,601 52	317 27	382 44	320 87	320 87	2 54	104 13
Norwood . . .	2,408 76	1,653 32	2,791 74	3,096 13	2,450 07	2,183 67	4,975 41	68 72	330 49	399 21	509 25	4 70	167 84
Oak Bluffs . .	7,953 91	741 48	7,953 91	741 48	121 09	862 57	8,827 23	94 13	1,183 61	1,277 74	434 43	2 07	71 06
Orange . . .	14,095 53	754 20	14,849 73	9,525 35	12,439 32	21,964 67	36,814 40	157 45	2,596 93	2,754 38	576 12	4 79	290 45
Orleans . . .	3,809 37	1,203 30	3,809 37	1,203 30	1,274 98	2,478 28	6,023 33	50 14	271 27	331 41	136 02	4 70	127 50
Oxford . . .	1,915 42	110 57	1,915 42	110 57	110 57	110 57	2,861 94	331 71	463 23	799 15	500 20	2 19	233 25
Palmer . . .	15,935 20	12,637 25	17,232 45	17,232 45	5 00	10,113 66	36,499 97	335 92	1 39	301 16	488 55	3 60	265 79
Paxton . . .	18,052 19	10,131 37	18,052 19	10,131 37	5 00	719 44	29,245 03	299 77	2,004 11	2,080 20	497 25	3 35	11 10
Pembroke . . .	601 48	221 84	634 79	635 87	635 87	635 87	1,270 66	111 48	319 53	431 01	244 35	1 99	98 72
Pepperell . . .	4,401 95	2,610 70	4,401 95	2,610 70	2,610 70	2,610 70	9,575 43	202 62	202 62	368 42	278	2 78	249 82
Phillipsburg .	35,955 03	5,045 54	35,955 03	5,045 54	5,045 54	5,045 54	47,611 62	730 79	177 63	898 42	653 01	7 00	295 95
Pittsfield . . .	2,186 15	140 83	2,327 03	5,936 96	12,699 95	15,026 98	15,026 98	61 25	2,581 29	2,642 54	868 10	2 80	75 18
Plainville . .	8,926 40	721 32	9,647 72	5,189 58	1,934 84	6,124 40	15,772 12	57 75	74 85	132 60	175 47	12 49	336 90
Plymouth . . .	1,409 97	2,314 00	2,314 00	1,566 98	1,566 98	1,566 98	4,102 12	405 39	168 40	1,092 85	168 40	2 23	288 04
Princeton . . .	1,884 78	110 53	1,884 78	110 53	110 53	110 53	7,569 47	100 53	1,629 07	1,729 00	649 34	2 10	50 17
Provincetown .	5,781 95	189 74	5,971 69	8,015 92	4,516 01	12,631 83	18,503 62	71 06	1,681 39	1,762 45	737 41	2 67	93 17
Quincy . . .	1,312 11	107 48	1,419 89	4,813 45	2,664 55	6,978 05	8,397 59	56 57	1,402 39	1,458 96	515 82	1 90	51 83
Randolph . . .	776 75	131 10	807 85	36 65	962 47	999 12	1,906 97	53 73	394 45	448 18	111 25	2 44	71 73
Raynham . . .	8,218 00	1,593 10	8,218 00	1,593 10	1,593 10	1,593 10	15,202 41	425 96	22 35	448 31	378 64	3 74	292 85
Reading . . .	4,115 89	352 54	4,468 43	6,166 38	897 79	7,064 17	11,532 60	53 91	137 28	191 19	192 88	6 54	173 43
Rehoboth . . .	6,652 64	1,030 48	7,683 12	10,276 09	136 71	10,412 80	18,095 92	824 38	109 37	933 75	1,012 64	1 25	313 78
Revereh . . .	4,274 26	2,332 65	2,332 65	2,332 65	2,332 65	2,332 65	9,933 69	62 18	642 24	704 42	229 79	4 02	104 15
Richmond . . .	3,220 14	219 97	3,220 14	219 97	219 97	219 97	7,815 36	21 06	333 70	404 76	141 42	6 17	95 85
Rochester . . .	1,774 63	1,442 41	1,774 63	1,442 41	1,442 41	1,442 41	5,846 76	82 60	1,119 01	1,201 61	284 23	2 35	95 85
Rockland . . .	1,580 58	194 10	1,580 58	194 10	194 10	194 10	5,846 76	82 60	1,119 01	1,201 61	284 23	2 35	95 85

Table showing the Amounts expended for Repair, Maintenance, etc. — Concluded.

TOWN OR CITY.	AMOUNTS EXPENDED.					Total expended.	EXPENDED PER MILE IN 1913.			Cost per Mile Maintenance per Year.	Length under Maintenance (Miles).	Amount to be assessed on Cities and Towns.	
	REVENUE APPROPRIATION.			MOTOR VEHICLE FEES FUND.			From Revenue Appropriation.	From Motor Vehicle Fees Fund.	Total.				
	To 1913.	During 1913.	Total.	To 1913.	During 1913.								Total.
Rockport.	\$852 55	\$525 38	\$1,377 93	\$1,990 47	\$331 28	\$2,321 75	\$3,699 68	\$328 36	\$207 05	\$535 41	\$393 58	1.60	\$214 35
Rowley.	3,249 02	724 70	3,974 62	2,496 92	732 52	3,229 44	7,204 06	199 09	201 24	400 33	442 50	3.64	283 24
Russell.	23,483 67	3,724 98	27,213 65	13,562 35	927 14	14,489 40	41,703 16	559 31	139 21	698 52	417 69	6.66	527 25
Rutland.	841 34	536 73	1,378 07				1,378 07	462 70		462 70	148 49	1.16	91 83
Salem.	1,357 69	911 98	2,269 67	3,681 46	666 53	4,347 99	6,617 66	651 41	476 09	1,127 50	984 77	1.40	254 12
Salisbury.	2,200 77	790 11	2,990 88	1,871 88	5,714 28	7,586 16	10,577 04	141 34	1,022 23	1,163 57	492 64	5.59	348 87
Sandwich.	6,226 61	353 17	6,579 78	4,535 97	93 48	5,456 97	12,036 73	58 76	88 78	147 54	263 27	6.01	162 87
Saugus.	6,693 56	955 84	7,649 40	22,802 36	96 87	22,899 23	30,543 63	522 32	93 48	575 25	1,332 25	1.83	230 66
Scituate.	8,314 44	633 21	8,947 65	1,737 77	996 02	2,733 79	11,681 44	117 92	185 48	303 40	241 10	5.37	285 48
Seekonk.	4,040 96	253 21	4,294 17	3,280 56	9,974 97	13,255 53	17,549 70	41 99	1,654 22	1,696 21	519 37	6.03	136 51
Sharon.	233 25	50 70	283 95	24 00	265 45	289 45	573 40	79 22	414 77	493 99	176 43	.64	21 63
Shelburne.	7,185 49	238 07	7,423 56	592 46	99 92	692 38	8,115 94	110 22	46 26	156 48	217 64	2.16	93 86
Shrewsbury.	18,562 24	2,230 97	20,793 21	21,171 01	2,264 74	23,435 75	44,228 96	459 05	466 00	925 05	641 09	4.86	763 45
Somerset.	9,001 32	516 51	9,517 83	10,095 07	8,176 47	27,271 54	36,739 37	64 56	1,022 06	1,086 62	404 45	8.00	252 89
Somerville.	2,063 90	1,187 05	3,250 95	2,841 43	7,766 19	3,607 62	6,858 57	1,023 32	660 51	1,683 83	1,192 79	1.16	333 13
Southampton.	588 61	71 16	659 77				659 77			100 23	119 74	.71	22 63
Southborough.	2,627 40	731 90	3,359 30	2,381 38	34 00	2,415 38	5,774 77	198 35	9 21	207 56	257 68	3.69	313 16
Southbridge.	2,191 92	266 47	2,458 39	3,325 09	152 62	677 71	3,236 10	269 46	112 23	381 69	245 90	1.36	80 13
South Hadley.	16,955 75	2,450 60	19,406 35	13,555 95	517 60	13,873 55	33,779 90	417 93	73 31	491 24	504 78	7.06	735 66
Spencer.	8,371 54	1,230 87	9,602 41	3,798 74	410 82	4,209 56	13,811 97	402 25	134 25	536 50	494 51	3.06	276 63
Sterling.	3,767 06	1,552 57	5,319 63	1,078 13	799 80	7,197 56	7,197 56	304 43	156 82	461 25	205 11	5.10	421 63
Stockbridge.	6,491 59	1,006 09	7,497 68	817 67	439 05	1,256 72	8,754 40	304 88	133 05	437 93	472 18	3.30	281 77
Stonham.	7,021 70	830 80	7,852 50	4,196 95	40 76	4,237 71	12,090 30	352 88	255 80	551 60	561 29	1.58	215 66
Stoughton.	4,452 47	382 56	4,835 03	1,429 06	5,181 06	6,610 12	11,445 15	115 93	1,570 00	1,685 93	386 13	3.30	121 55
Sturbridge.	1,982 01	837 48	2,819 49	4,553 34	453 46	5,006 80	7,826 29	354 86	192 04	547 00	396 87	2.36	192 47
Sudbury.	17,914 74	3,463 32	21,378 06	8,286 21	1,986 20	8,484 41	29,862 47	677 75	38 79	716 54	473 74	5.11	491 18
Sunderland.	970 30	204 55	1,174 85	449 92	706 24	1,156 16	2,331 01	80 85	279 15	360 00	166 61	2.53	76 71
Sutton.	3,414 91	421 29	3,836 20	3,648 19	802 19	4,450 38	8,286 58	184 78	351 84	536 62	312 93	2.28	193 48
Swampscott.	5,488 88	1,367 50	6,856 38	3,492 55	375 90	3,868 54	10,724 92	917 79	252 34	1,170 13	504 46	1.49	390 66
Swansea.	2,434 90	496 39	2,931 29	4,332 83	5,224 79	5,457 62	8,388 91	74 65	785 68	860 33	240 57	6.65	244 25
Taunton.	5,787 76	285 76	6,073 52	4,346 02	1,738 09	6,084 11	12,157 63	42 33	257 49	289 82	215 29	6.75	155 78
Templeton.	4,052 28	989 13	5,041 41	10,352 71	1,738 09	11,522 99	16,504 27	173 84	205 67	295 90	385 75	5.69	416 51
Tewksbury.	3,279 28	1,774 53	5,053 81	4,206 24	1,170 28	4,206 24	9,260 05	295 76	205 23	370 50	148 42	6.00	467 45
Tisbury.	2,640 29	55 56	2,695 85	4,206 24	1,323 36	1,356 59	4,082 44	28 79	685 68	714 47	114 54	1.93	23 31

Townsend,	4,971 67	867 20	5,838 87	325 21	7,022 78	7,947 99	13,786 86	143 81	1,264 14	1,407 95	208 00	6.03	310 64
Turo,	5,274 24	364 57	5,578 81	706 01	1,394 83	2,100 84	7,679 65	96 38	441 40	557 78	190 51	3.16	145 05
Tyngsborough,	8,324 90	1,126 23	9,451 23	1,378 71	1,222 51	2,160 84	11,052 45	166 37	32 87	199 24	183 62	6.77	425 54
Uxbridge,	3,063 45	334 62	3,398 07	4,929 27	299 82	5,274 60	8,672 67	101 09	104 33	265 42	268 92	3.31	149 97
Wales,	585 66	602 74	1,188 40	9,988 94	1,220 11	11,209 05	24,279 56	530 43	242 57	278 00	339 00	5.03	98 58
Walpole,	12,892 32	178 19	13,070 51	9,988 94	1,220 11	11,209 05	24,279 56	530 43	242 57	278 00	167 64	4.18	611 12
Ware,	4,049 19	2,216 42	6,265 61	5,168 47	11,578 40	17,746 87	29,595 32	119 97	1,301 63	1,511 60	491 77	8.32	334 34
Wareham,	10,850 32	998 13	11,848 45	6,165 37	2,918 20	8,671 47	21,246 42	194 67	711 76	906 43	407 33	4.10	296 36
Warren,	11,876 79	798 16	12,674 95	5,653 27	1,378 56	7,451 70	12,134 24	460 19	1,621 84	2,082 03	831 68	.85	133 19
Watertown,	4,291 38	391 16	4,682 54	5,568 72	1,117 25	5,679 97	19,667 78	61 73	43 12	654 85	577 27	2.59	212 18
Wayland,	12,409 55	1,578 26	13,987 81	5,568 72	791 70	842 22	1,820 09	185 72	305 71	491 43	329 72	1.18	103 41
Webster,	496 86	481 01	977 87	50 43	10,645 55	13,372 77	17,087 19	268 79	9,021 65	9,290 44	1,208 42	4.65	185 49
Wellesley,	3,397 90	317 17	3,714 37	2,727 22	1,103 36	2,024 87	11,396 81	102 38	237 28	329 61	172 72	1.76	239 91
Wellfleet,	4,762 42	475 84	5,238 26	921 51	1,76 42	3,112 96	11,396 81	102 38	237 28	329 61	172 72	1.76	239 91
Wenham,	7,564 85	1,019 00	8,583 85	3,036 54	53 16	53 16	2,679 38	254 82	17 78	272 60	90 82	2.99	325 81
Westborough,	1,864 28	761 92	2,626 20	368 32	53 16	53 16	2,679 38	254 82	17 78	272 60	90 82	2.99	325 81
West Boylston,	4,420 68	513 45	4,934 13	2,948 81	9 50	377 62	5,311 95	210 43	3 80	214 32	226 61	3.41	167 21
West Bridgewater,	13,342 32	135 79	13,478 31	2,948 81	724 80	3,673 11	17,151 42	42 97	229 21	272 18	478 28	3.16	174 09
West Brookfield,	4,451 02	599 75	5,051 37	717 88	221 22	5,369 21	5,990 47	224 63	82 85	307 48	202 24	5.81	142 00
Westfield,	22,387 77	2,144 83	24,532 60	6,071 16	9,498 05	15,569 21	40,101 81	369 16	1,684 78	2,003 94	408 58	5.81	708 05
Westford,	3,833 70	512 71	4,346 41	6,071 16	9,498 05	15,569 21	40,101 81	369 16	1,684 78	2,003 94	408 58	5.81	708 05
Westminster,	11,685 14	1,254 20	12,939 34	11,083 74	7,961 19	19,644 93	32,154 27	156 99	1,516 42	1,673 41	465 33	5.25	334 91
West Newbury,	13,680 47	1,124 89	14,805 36	5,365 24	189 47	5,554 71	20,360 07	221 00	37 22	258 22	376 06	5.09	473 66
Weston,	20,515 19	552 59	21,067 78	7,385 11	20,674 26	28,059 37	49,127 15	175 42	6,563 26	6,738 68	1,113 99	3.15	140 49
Westport,	11,869 42	124 63	11,994 10	11,312 21	2,541 68	13,853 89	25,847 99	29 34	598 04	627 38	363 23	4.25	69 23
West Springfield,	7,227 02	1,877 04	9,104 06	7,789 56	25 99	7,815 55	16,919 61	690 09	9 56	699 65	659 11	2.72	337 22
West Tisbury,	1,797 02	1,798 02	1,798 02	-	2,421 08	2,421 08	4,219 10	19	452 54	452 73	60 06	5.35	58
Westwood,	2,030 34	141 09	2,171 43	1,764 97	659 45	2,424 42	4,595 85	133 10	622 12	755 32	328 27	1.06	65 61
Weymouth,	18,136 13	865 21	19,001 34	3,587 13	8,714 43	12,301 56	31,302 90	124 85	1,257 49	1,382 34	473 35	6.93	411 53
Whately,	12,612 29	820 22	13,432 51	2,773 65	6,652 74	9,726 39	23,158 90	210 85	1,787 34	1,908 19	582 17	3.89	222 59
Wilmington,	3,472 36	58 70	3,531 96	4,185 04	236 80	4,421 84	7,953 80	34 53	139 20	173 82	265 38	1.70	29 92
William,	13,662 26	2,280 43	15,912 29	11,885 80	26 73	11,912 62	27,824 91	431 56	5 27	456 53	449 65	5.07	534 02
Williamburg,	4,018 88	1,443 40	5,462 28	2,669 38	2,381 89	5,051 27	10,413 55	167 32	898 83	1,066 15	293 92	2.65	184 43
Williamstown,	10,284 77	1,030 12	11,314 80	5,220 36	4 15	5,224 51	16,539 40	629 83	2 57	642 40	525 30	1.61	234 70
Winchester,	5,896 75	784 62	6,681 37	832 88	2,900 09	4,533 94	11,214 91	124 38	2 15	126 53	160 92	3.67	207 92
Winchendon,	909 49	784 62	6,681 37	2,953 45	459 70	197 60	1,107 09	402 37	1,169 28	1,571 65	422 88	1.95	239 58
Windsor,	1,171 97	238 05	1,410 02	1,970 19	459 70	459 70	1,869 72	127 98	247 15	375 13	115 05	1.86	93 00
Woburn,	4,120 64	890 08	5,010 72	7,001 31	20 40	1,990 59	7,869 31	341 03	7 82	348 85	284 72	2.61	259 63
Worcester,	20,624 96	1,487 87	22,112 83	5,080 98	2,481 45	2,967 46	29,674 76	365 57	609 69	975 26	582 66	4.07	434 21
Wrentham,	7,206 90	191 91	7,398 81	3,628 99	4,007 28	7,636 37	15,035 08	31 36	654 78	686 14	212 21	6.12	104 83
Yarmouth (north),	5,316 54	317 04	5,633 58	4,157 35	2,072 32	6,229 67	20,806 08	85 46	235 49	390 98	140 61	3.71	305 01
Yarmouth (south),	8,586 36	356 47	8,942 83	4,157 35	2,072 32	6,229 67	20,806 08	70 03	235 49	390 98	140 61	5.09	

APPENDIX J.

STATEMENT SHOWING THE NUMBER OF PETITIONS RECEIVED AND THE LENGTH PETITIONED FOR, THE LAYOUTS MADE AND THEIR LENGTH AND DISTRIBUTION IN THE VARIOUS COUNTIES OF THE COMMONWEALTH.

COUNTIES.	PETITIONS RECEIVED.				PETITIONS SITUATED IN —			LAYOUTS MADE IN —			Number of Layouts.
	County.	City.	Town.	Totals.	City.	Town.	Totals.	City.	Town.	Totals.	
Barnstable,	4	—	48	52	—	15	15	—	15	15	112
Berkshire,	17	12	54	83	2	29	31	2	18	20	113
Bristol,	4	7	49	60	2	17	19	1	17	18	110
Dukes,	3	—	6	9	—	6	6	—	6	6	27
Essex,	7	24	60	91	7	25	32	7	18	25	134
Franklin,	2	—	62	64	—	18	18	—	15	15	100
Hampden,	4	6	33	43	3	17	20	2	11	13	87
Hampshire,	1	6	50	57	1	17	18	1	12	13	84
Middlesex,	14	26	100	140	9	43	52	7	34	41	187
Nantucket,	—	—	1	1	—	1	1	—	1	1	14
Norfolk,	12	6	58	66	1	26	27	1	22	23	96
Plymouth,	—	7	65	72	1	25	26	1	19	20	130
Suffolk,	—	3	6	9	2	2	4	2	1	3	9
Worcester,	1	9	166	176	2	57	59	3	44	47	262
Totals,	59	106	758	923	30	298	328	27	233	260	1,465

NUMBER OF PETITIONS RECEIVED, ETC. — *Concluded.*

COUNTIES.	LENGTHS PETITIONED FOR.		LENGTHS LAID OUT.					
			1894-1912.		1913.		TOTALS.	
	Feet.	Miles.	Feet.	Miles.	Feet.	Miles.	Feet.	Miles.
Barnstable,	739,981	140.15	529,318	100.25	24,664	4.67	553,982	104.92
Berkshire,	875,686	165.85	343,894	65.14	73,713	13.96	417,607	79.10
Bristol,	857,399	162.39	375,550	71.13	27,188	5.15	402,738	76.28
Dukes,	155,363	29.43	96,059	18.19	25,390	4.81	121,449	23.00
Essex,	1,188,846	225.16	401,781	76.09	19,543	3.70	421,324	79.79
Franklin,	724,567	137.23	279,950	53.02	10,899	2.06	290,849	55.08
Hampden,	714,204	135.34	301,571	57.11	2,290	.44	303,861	57.55
Hampshire,	525,574	99.54	219,251	41.52	11,877	2.25	231,128	43.77
Middlesex,	1,706,097	323.11	681,991	129.18	28,212	5.33	710,203	134.51
Nantucket,	34,185	6.47	34,211	6.48	—	—	34,211	6.48
Norfolk,	765,711	145.02	303,444	57.46	10,107	1.92	313,551	59.38
Plymouth,	1,064,989	201.70	511,268	96.83	24,850	4.71	536,118	101.54
Suffolk,	69,815	13.23	19,016	3.60	13,032	2.47	32,048	6.07
Worcester,	2,001,381	379.03	761,925	144.31	45,384	8.59	807,309	152.90
Totals,	11,423,798	2,163.65	4,859,229	920.31	317,149	60.06	5,176,378	980.37

APPENDIX K.

TABLE SHOWING THE WORK DONE UNDER THE "SMALL TOWN" ACT SINCE ITS PASSAGE IN 1900.

[Section 17, Chapter 47, Revised Laws, and Chapter 279, Acts of 1908.]

TOWNS.	ALLOTMENTS.			LENGTHS BUILT (FEET).			Types of Roads.
	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.	
<i>Barnstable County.</i>							
Eastham,	\$2,260 40	\$1,000 00 ¹	\$3,260 40	8,750	3,740	12,490	Grading; sand and oil.
Harwich,	1,000 00	300 00	1,300 00	—	7,705	7,705	Sand and oil.
Mashpee,	1,200 00	—	1,200 00	1,944	—	1,944	Sand and oil.
Provincetown,	5,095 56	—	5,095 56	9,930	—	9,930	Macadam.
Wellfleet,	1,653 00	—	1,653 00	2,250	—	2,250	Broken stone and clay.
	\$11,208 96	\$1,300 00	\$12,508 96	22,874	11,445	34,319	
<i>Berkshire County.</i>							
Alford,	\$2,769 00	\$600 00 ²	\$3,369 00	6,813	2,394	9,207	Gravel.
Becket,	3,550 00	1,600 00 ³	5,150 00	4,580	2,100	6,680	Gravel and macadam.
Egremont,	5,246 00	986 30 ⁴	6,232 30	9,730	5,387	15,117	Gravel.
Florida,	5,136 00	1,550 00 ⁵	6,686 00	8,506	22,704	31,300	Gravel and grading.
Hancock,	1,198 39	1,700 00 ⁶	2,898 39	1,890	2,900	4,090	Gravel.
Hinsdale,	2,500 00	1,500 00 ⁷	4,000 00	3,125	2,050	5,175	Bituminous macadam and gravel.
Lanesborough,	2,952 00	1,700 00 ⁸	4,652 00	5,500	— ⁸	5,500	Gravel road and steel concrete bridge.
Monterey,	3,968 00	800 00 ⁹	4,768 00	14,200	600	14,800	Gravel and culverts.

¹ Town contributed \$1,500.² Town contributed \$200.³ Town contributed \$800.⁴ Town contributed \$500.⁵ Town contributed \$1,000.⁶ Town contributed \$300.⁷ Town and county contributed \$1,200.⁸ Work begun but not completed.⁹ Town contributed \$400.

WORK DONE UNDER THE "SMALL TOWN" ACT — Continued.

TOWNS.	ALLOTMENTS.			LENGTHS BUILT (FEET).			Types of Roads.
	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.	
<i>Berkshire County — Con.</i>							
Mount Washington,	\$2,192 00	\$450 00	\$2,642 00	2,780	1,200	3,980	Gravel and bridge repairs.
New Ashford,	961 00	1,600 00 ¹	2,561 00	2,600	— ²	2,600	Gravel road and culvert construction and repairs.
New Marlborough,	8,878 00	1,500 00 ³	10,378 00	24,750	6,400	31,150	Gravel.
Otis,	4,785 92	750 00	5,535 92	11,250	700	11,950	Gravel road and culvert repairs.
Peru,	2,791 00	400 00	3,191 00	9,345	— ⁴	9,345	Gravel.
Richmond,	1,750 00	2,000 00 ⁵	3,750 00	3,489	3,400	6,889	Gravel and macadam.
Sandisfield,	9,110 00	800 00 ⁶	9,910 00	20,018	1,940	21,958	Macadam.
Savoy,	5,855 00	650 00	6,505 00	10,846	1,050	11,896	Gravel.
Sheffield,	7,488 00	1,000 00 ⁷	8,488 00	14,232	1,950	16,182	Grading and gravel.
Tyringham,	4,765 00	1,400 00 ⁸	6,165 00	5,550	4,450	10,000	Grading and macadam.
Washington,	5,398 00	900 00 ⁹	6,298 00	9,940	1,400	11,340	Grading and gravel.
West Stockbridge,	6,826 00	800 00 ⁹	7,626 00	14,495	705	15,200	Gravel.
Windsor,	1,500 00	1,000 00 ⁹	2,500 00	1,110	—	1,110	Macadam.
	\$89,619 31	\$22,686 30	\$112,305 61	184,839	60,630	245,469	
<i>Bristol County.</i>							
Easton,	\$12,000 00	—	\$12,000 00	31,686	—	31,686	Macadam.
Freewtown,	—	\$2,350 00 ⁷	2,350 00	—	— ²	—	Macadam.
Norton,	4,176 00	—	4,176 00	9,850	—	9,850	Macadam.
Raynham,	3,316 00	—	3,316 00	6,135	—	6,135	Macadam.
Rehoboth,	3,500 00	2,000 00 ⁷	5,500 00	5,100	2,550	7,650	Macadam and gravel.
Westport,	3,400 00	—	3,400 00	6,150	—	6,150	Macadam.
	\$26,392 00	\$4,350 00	\$30,742 00	58,921	2,550	61,471	
<i>Dukes County.</i>							
Gay Head,	\$400 00	—	\$400 00 ¹⁰	—	—	—	—
	\$400 00	—	\$400 00	—	—	—	—

Essex County.

Boxford,	\$2,261 00	-	\$2,261 00	14,880	4,814 ¹¹	19,694	Gravel.
Danvers,	7,000 00	-	7,000 00	10,700	-	19,700	Gravel.
Essex,	932 00	-	932 00	22,000	-	22,000	Gravel and repairs.
Georgetown,	2,950 00	-	2,950 00	15,437	-	15,437	Gravel and macadam.
Groveland,	1,000 00	-	1,000 00	12,740	-	12,740	Bituminous gravel.
Lynnfield,	\$1,500 00 ⁷	-	1,500 00	-	- ²	-	Gravel.
Marblehead,	7,800 00	-	7,800 00	11,008	-	11,008	Macadam.
Middleton,	3,444 00	-	3,444 00	10,800	-	10,800	Gravel.
North Andover,	2,000 00	500 00 ⁷	2,500 00	9,050	2,400	11,450	Gravel.
Salisbury,	1,948 00	-	1,948 00	2,150	-	2,150	Macadam.
Saugus,	1,200 00	-	1,200 00	900	-	900	Bituminous macadam.
Swampscott,	2,925 00	-	2,925 00	5,200	-	5,200	Macadam.
Topsheld,	4,984 00	-	4,984 00	35,375	-	35,375	Gravel.
West, Newbury,	-	1,000 00 ⁷	1,000 00	-	1,400	1,400	Macadam.
	\$38,444 00	\$3,000 00	\$41,444 00	159,240	8,614	167,854	

Franklin County.

Ashfield,	-	\$1,000 00 ⁷	\$1,000 00	-	3,350	3,350	Gravel.
Barnardston,	\$2,965 00	2,000 00 ⁷	2,965 00	16,400	-	16,400	Gravel.
Buckland,	3,200 00	1,200 00 ¹²	4,400 00	1,754	5,280 ²	7,034	Gravel and grading.
Charlmont,	900 00	2,000 00 ¹³	2,900 00	2,650	5,600	8,250	Gravel.
Colrain,	6,252 00	1,000 00 ⁹	7,252 00	11,900	2,050	14,010	Gravel.
Conway,	3,212 00	-	3,212 00	11,575	-	11,575	Gravel.
Gill,	2,997 00	500 00 ¹⁴	3,497 00	7,600	3,475	11,075	Gravel, road and bridge repairs.
Hawley,	4,027 00	450 00	4,477 00	8,272	3,000	11,272	Grading and gravel.
Heath,	6,326 00	850 00 ¹⁵	7,176 00	15,079	5,450	20,529	Gravel.
Leverett,	3,593 00	400 00 ¹⁴	3,993 00	12,900	700	13,600	Gravel.
Leyden,	4,467 04	600 00 ⁸	5,067 04	9,120	1,950	11,070	Gravel.
Monroe,	6,552 00	1,300 00 ⁹	7,852 00	13,022	5,000	18,022	Gravel.
New Salem,	1,950 00	500 00 ¹⁶	2,450 00	4,470	6,755	11,225	Gravel.
Orange,	4,223 00	1,100 00 ¹⁶	5,323 00	11,716	2,350	14,066	Gravel.
Rowe,	3,934 00	-	3,934 00	10,950	-	10,950	Gravel.
Shutesbury,	5,470 00	-	5,470 00	7,000	-	7,000	Gravel.
Warwick,	7,538 00	1,050 00 ¹⁵	8,588 00	11,800	4,000	15,800	Grading and gravel.
Wendell,	\$67,006 04 [*]	\$13,950 00	\$81,556 04	156,268	48,960	205,228	

¹ Town and county contributed \$1,200.² Work begun but not completed.³ Town contributed \$1,000.⁴ Work not yet begun.⁵ Town contributed \$1,300.⁶ Town contributed \$300.⁷ Town contributed an equal amount.⁸ Town contributed \$200.⁹ Town contributed \$500.¹⁰ Withdrawn March 25, 1913.¹¹ Built with 1912 allotments.¹² Town contributed \$400.¹³ Town contributed \$1,500.¹⁴ Town contributed \$100.¹⁵ Town contributed \$250.¹⁶ Town contributed \$600.

WORK DONE UNDER THE "SMALL TOWN" ACT — Continued.

TOWNS.	ALLOTMENTS.			LENGTHS BUILT (FEET).			Types of Roads.
	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.	
<i>Hampden County.</i>							
Blandford,	\$6,235 16	—	\$6,235 16	9,010	—	9,010	Grading and gravel.
Chester,	621 79	\$1,449 64 ¹	2,071 43	1,950	2,651	4,601	Gravel.
East Longmeadow,	1,863 75	3,000 00 ²	4,863 75	4,610	— ³	4,610	Gravel and macadam.
Granville,	7,323 00	1,300 00 ⁴	8,623 00	13,507	5,508	19,105	Grading and gravel.
Hampden,	5,058 00	600 00 ¹	5,658 00	36,200	4,908	41,108	Gravel.
Holland,	564 00	250 00	814 00	2,425	500	2,925	Grading and gravel.
Longmeadow,	1,200 00	—	1,200 00	1,425	—	1,425	Macadam and concrete culvert.
Monson,	—	1,500 00 ²	1,500 00	—	2,150	2,150	Macadam.
Montgomery,	1,820 00	400 00	2,220 00	4,750	700	5,450	Gravel.
Russell,	1,393 85	1,300 00 ³	2,693 85	600	— ³	600	Grading.
Southwick,	5,128 00	1,500 00 ⁴	6,628 00	20,586	2,175	22,761	Grading, gravel and concrete culvert.
Tolland,	4,742 06	800 00 ⁶	5,542 06	5,500	3,612	9,112	
	\$35,949 61	\$12,099 64	\$48,049 25	100,653	22,294	122,947	
<i>Hampshire County.</i>							
Amherst,	\$4,800 00	—	\$4,800 00	4,435	—	4,435	Macadam.
Chesterfield,	5,870 00	\$948 88 ⁷	6,818 88	7,061	2,015	9,076	Gravel.
Cummington,	4,233 00	—	4,233 00	9,900	—	9,900	Gravel.
Easthampton,	2,000 00	—	2,000 00	2,430	—	2,430	Macadam.
Enfield,	6,314 00	856 56 ⁸	7,170 56	23,610	7,500	31,110	Gravel.
Goshen,	—	700 00 ⁹	700 00	—	— ³	—	Gravel.
Greenwich,	3,176 00	900 00 ⁴	4,076 00	4,600	4,790	9,390	Gravel.
Hadley,	—	1,500 00 ²	1,500 00	—	— ³	—	Macadam.
Hatfield,	1,500 00	1,000 00 ³	2,500 00	4,340	— ³	4,340	Macadam.
Huntington,	1,800 00	1,250 00 ²	3,050 00	5,425	— ³	5,425	Gravel.
Middlefield,	2,560 00	400 00	2,960 00	6,200	1,958	8,158	Gravel.
Pelham,	4,670 00	1,000 00 ¹⁰	5,670 00	9,600	500	10,100	Gravel.
Plainfield,	4,080 00	500 00 ⁸	4,580 00	5,336	1,138	6,474	Gravel.
Prescott,	4,528 50	600 00 ¹	5,128 50	8,430	1,600	10,030	Grading and gravel.
Southampton,	2,350 00	1,173 83 ¹¹	3,523 83	1,963	5,804	7,767	Gravel.
Westhampton,	5,059 00	727 35 ⁶	5,786 35	13,538	1,161	14,699	Gravel.
Williamsburg,	1,500 00	—	1,500 00	4,100	—	4,100	Macadam.
Worthington,	7,677 00	1,000 00 ⁴	8,677 00	15,665	2,212	17,877	Gravel.
	\$62,117 50	\$12,556 62	\$74,674 12	126,633	28,678	155,311	

WORK DONE UNDER THE "SMALL TOWN" ACT — *Concluded.*

TOWNS.	ALLOTMENTS.			LENGTHS BUILT (FEET).			Types of Roads.
	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.	
<i>Plymouth County.</i>							
Abington,	\$2,600 00	—	\$2,600 00	5,760	—	5,760	Macadam.
Bridgewater,	576 20	—	576 20	3,590	—	3,590	Surfacing.
Carver,	15,990 00	\$2,000 00 ¹	17,990 00	46,545	8,740	55,285	Macadam.
Duxbury,	—	500 00 ²	500 00	—	3,600	3,600	Gravel.
East Bridgewater,	9,142 87	1,000 00 ³	10,142 87	17,090	— ⁴	17,090	Macadam and bituminous macadam.
Halifax,	5,304 00	1,000 00 ⁵	6,304 00	10,582	— ⁶	10,582	Macadam.
Hanover,	2,048 82	—	2,048 82	2,827	—	2,827	Macadam.
Hanson,	12,092 00	1,605 25 ³	14,507 25	38,761	3,761	42,522	Macadam.
Lakeville,	2,200 00	4,000 00 ³	6,200 00	12,790	8,391	21,181	Macadam and gravel.
Norvell,	3,880 00	—	3,880 00	19,111	— ⁴	19,111	Gravel.
Pembroke,	5,423 45	1,000 00 ³	6,423 45	31,907	—	31,907	Gravel and macadam.
Plymouth,	1,000 00	—	1,000 00	2,000	—	2,000	Sand and oil.
Plymouth,	3,467 00	700 00 ⁷	4,167 00	21,099	3,501	24,600	Gravel.
Rochester,	6,350 00	1,000 00 ³	7,350 00	25,304	7,268	32,572	Macadam and gravel.
Rockland,	1,000 00	1,125 00 ³	2,125 00	2,165	2,537	4,702	Macadam.
Wareham,	1,674 43	—	1,674 43	7,200	—	7,200	Sand and oil.
	\$73,648 77	\$13,930 25	\$87,579 02	246,731	37,798	284,529	
<i>Worcester County.</i>							
Ashburnham,	\$8,094 00	\$1,500 00 ³	\$9,594 00	21,965	4,750	26,715	Gravel.
Berlin,	5,224 00	800 00 ²	6,024 00	18,833	2,400	21,233	Gravel.
Bolton,	5,414 00	700 00 ²	6,114 00	27,960	2,000	29,960	Gravel.
Boylston,	3,060 00	1,000 00	4,060 00	12,190	2,600	14,790	Gravel.
Brimfield,	1,000 00	1,600 00 ¹⁰	2,600 00	—	3,170	3,170	Gravel.
Brookfield,	900 00	—	900 00	2,500	—	2,500	Macadam.
Dana,	5,169 00	400 00	5,569 00	13,925	1,050	14,975	Gravel.
Douglas,	—	1,500 00 ¹¹	1,500 00	—	4,500	4,500	Macadam.
Hardwick,	6,000 00	3,000 00 ¹²	9,000 00	8,350	— ⁴	8,350	Macadam.
Harvard,	800 00	1,400 00 ¹³	2,200 00	—	2,875	2,875	Macadam.
Holden,	1,200 00	—	1,200 00	1,600	—	1,600	Gravel.
Hubbardston,	4,085 00	1,800 00 ¹⁰	5,885 00	8,580	4,000	12,580	Gravel.
Mendon,	5,464 00	1,575 00 ¹¹	7,039 00	18,742	1,900	20,642	Gravel and repairs.

[illegible]

SUMMARY.

COUNTIES.	ALLOTMENTS.			LENGTHS BUILT (FEET).		
	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.	Previous to 1913.	In 1913.	Total to Nov. 30, 1913.
Barnstable,	\$11,208 96	\$1,300 00	\$12,508 96	22,874	11,445	34,319
Berkshire,	89,619 31	22,686 30	112,305 61	184,839	60,630	245,469
Bristol,	26,392 00	4,350 00	30,742 00	58,921	2,550	61,471
Dukes,	400 00	—	400 00 ¹	—	—	—
Essex,	38,444 00	3,000 00	41,444 00	159,240	8,614	167,854
Franklin,	67,606 04	13,950 00	81,556 04	156,268	48,960	205,228
Hampden,	35,949 61	12,099 64	48,049 25	100,653	22,294	122,947
Hampshire,	62,117 50	12,556 62	74,674 12	126,633	28,678	155,311
Middlesex,	96,549 69	14,332 18	110,881 87	226,104	28,947	255,051
Norfolk,	17,285 00	1,874 92	19,159 92	46,491	9,704	56,195
Plymouth,	73,648 77	13,920 25	87,579 02	246,731	37,798	284,529
Worcester,	86,964 65	33,373 00	120,339 65	214,587	64,440	278,827
	\$606,185 53	\$139,454 91	\$745,640 44	1,543,201	324,060	1,867,261

¹ Withdrawn March 25, 1913.

APPENDIX L.

APPROPRIATIONS.

Appropriations for the Construction and Repair of State Highways.

1894, chapter 497, section 8,	\$300,000 00
1895, chapter 347, section 3,	400,000 00
1896, chapter 481, section 3,	600,000 00
1897, chapter 340, section 1,	800,000 00
1898, chapter 539, section 1,	400,000 00
1899, chapter 396, section 1,	500,000 00
1900, chapter 442, section 1,	500,000 00
1901, chapter 269, section 1,	500,000 00
1902, chapter 246, section 1,	500,000 00
1903, chapter 280, section 1,	2,250,000 00 ¹
1907, chapter 446, section 1,	2,500,000 00 ¹
1912, chapter 704, section 1,	5,000,000 00 ¹
	<hr/>
	\$14,250,000 00

Appropriations for the Salaries and Expenses of the Commission, paid from the Treasury of the Commonwealth.

1898, chapter 497, section 1,	\$14,300 00
1899, chapter 367, section 1,	28,500 00
1900, chapter 141, section 1,	28,500 00
1901, chapter 451, section 1,	33,750 00
1902, chapter 67, section 1,	33,750 00
1903, chapters 14 and 485, section 1,	43,950 00 ²
1904, chapters 19 and 461, section 1,	39,300 00 ²
1905, chapters 36, 431 and 480, section 1,	46,150 00 ²
1906, chapters 36 and 140, section 1,	49,514 14 ²
1907, chapter 157, section 1,	66,950 00 ³
1908, chapter 212, section 1,	76,300 00 ³
1909, chapter 127,	47,300 00 ⁴
1910, chapter 139,	56,250 00 ⁴
1911, chapter 555, section 1,	61,250 00 ⁴
1912, chapter 287, section 1,	61,500 00 ⁴
1913, chapter 35, section 1,	98,500 00 ⁵

¹ To cover expenses of construction for a period of five years.² Includes expenses of automobile department.³ Includes expenses of moth suppression and automobile department in part.⁴ Includes expense of moth suppression.⁵ Includes expense of moth suppression and maintenance of Fall River and Newburyport bridges.

Appropriations for Maintenance, paid from the Treasury of the Commonwealth.

1903, chapter 280, section 2,	\$40,000 00
1904, chapter 316, section 1,	50,000 00
1905, chapter 36, section 1,	60,000 00
1906, chapter 36, section 1,	64,166 66
1907, chapter 157, section 1,	100,000 00
1908, chapters 212 and 657, section 1,	150,000 00
1909, chapters 127 and 493, section 1,	250,000 00
1910, chapter 139, section 1,	200,000 00
1911, chapter 555, section 1,	200,000 00
1912, chapter 287, section 1,	200,000 00
1913, chapter 35, section 1,	200,000 00

APPENDIX M.

REPORT ON THE CHANGES OF TELEPHONE RATES IN MASSACHUSETTS, 1908-1913.

BOSTON, MASS., June 28, 1913.

To the Honorable Massachusetts Highway Commission, Boston, Mass.

GENTLEMEN:—We give you herewith a summary of the telephone rate changes which have taken place under your direction since the beginning of 1908, in matters in which we have served you as engineers. The rapid development of the telephone service in the Commonwealth during that period is typified by the growth of the number of telephones in Boston and its immediate suburbs. At the opening of 1908 the number of main telephone stations in what is now called the Metropolitan District and was then called the Boston and Suburban District was 69,924, and the total number of telephones was 95,851. On the last of April, 1913, the number of main stations was 114,789, and the total number of telephones was 160,539 in the same territory. This is an increase of 64.2 per cent. in main stations and 67.5 per cent. in total telephones in five and one-third years, that is, an average rate of increase of 12,100 total telephones per twelve months during that period. Main stations include subscribers' primary telephones and the trunk lines to private branch exchanges, but do not include extension telephones and private branch exchange terminal telephones. The total telephones comprise all installed subscribers' telephone instruments except those on switchboards.

Tables which are referred to later herein give the relations of the telephone equipment and traffic between the two dates.

I. RATE CHANGES OF 1908.

During 1907 a series of public hearings were held in respect to the telephone rates and service in and about Boston, and on January 21, 1908, you instructed Mr. Dugald C. Jackson of this firm to study the situation and give you a report in reply to the following three questions:—

1. Is an appraisal of the plant of the New England Telephone and Telegraph Company necessary before any satisfactory solution can be

had of the general problem of what should be the equitable rates for service of said company throughout its Massachusetts territory, and, if so, how should such inventory and appraisal be made and what would be the probable cost of the same?

2. Without prejudice to the general problem of what should be the equitable rates for service of the New England Telephone and Telegraph Company throughout its Massachusetts territory, and in the absence of a complete inventory and appraisal of the plant of said company, is it possible to reduce the toll rates now in force in the Boston and suburban division for toll business into and out from the so-called Metropolitan exchanges, and if such a reduction may be so made upon what basis should it be effected?

3. With the same premises as stated in Question 2, in order to improve the quality of the service given by the New England Telephone and Telegraph Company, is it possible and is it advisable to change at the present time the multi-party lines in the Boston and Suburban division to lines having not more than two subscribers thereon with the so-called "divided ringing" appliances?

The report giving our answers to these questions was delivered to you under date of March 10, 1908, to the effect that an adequate revision of the telephone rates could not be made without an inventory and appraisal of the property of the company and its subsidiaries, inasmuch as its books of records and accounts had not kept full record of the extent of the property, and that a preliminary adjustment of the Boston and Suburban toll rates ought to be made by reducing from ten cents to five cents the charge paid for messages between the several central offices in the Central District of Boston and the sixteen adjacent central offices as follows: Brighton, Brookline, Cambridge, Charlestown, Chelsea, Dorchester, East Boston, Everett, Jamaica Plain, Malden, Medford, Revere, Roxbury, Somerville, South Boston and Winthrop. Your Honorable Commission recommended to the telephone company that the aforesaid change in toll rates should be made, and the rates were put into effect. The change reduced by one-half the toll rates for all messages between the offices in the Central District and suburban offices within five miles of the centre of gravity of the Central District.

At the time that this adjustment of the toll rates was made there was in existence substantially no data or experience of the effect that changes of this kind in such a territory would make on the message traffic, and it was therefore very difficult to forecast what the result would be on the company's revenue from these messages, which revenue at that time amounted to a considerable sum. Using the best information which we could bring to bear on the subject,

we estimated that the number of messages of the classes involved would gradually increase after the ten cent price was reduced to five cents, so that the traffic on which ten cents had been charged might be expected to nearly or about double in a couple of years.

When the further adjustment of rates was made two years later as the result of the inventory of the telephone company's property, the five cent radius was increased to eight miles, within which radius are included the following central offices in addition to those already named: Arlington, Bellevue (formerly part of the Jamaica Plain central office), Belmont, Hyde Park, Melrose, Milton, Newton North, Newton South, Quincy and Winchester. The new rates were also made to count all messages within the radius as applying on the guarantee on the measured rate schedule, and hence these messages now cost three cents after a zone measured rate telephone has used its guaranteed number of calls. The reduction brought about by the recommendation of the Commission for the latter messages during the last five years is therefore seventy per cent. of the original price.

The total number of messages transmitted in 1906 in unlimited service, measured service and the ten cent toll service between Boston and the sixteen exchanges within the five mile radius was reported in our report of March 10, 1908. Considerable of this traffic was in unlimited service which then was available for the undivided Boston and Suburban District. Table No. 1 gives the data of that time and the data of corresponding traffic at the present time. At the present time all such traffic is charged for either in measured service or as a toll charge in zone unlimited service, there now being no unlimited service which crosses the border between the Central District and the Suburban District. It is to be observed from Table No. 1 that this traffic has now increased to nearly double what it was in the year 1906. These messages are now charged for either as measured or toll service at 3 cents or 5 cents each. The telephone company has been able to more efficiently utilize the interconnecting trunk lines over which this traffic goes between central offices on account of the denser traffic to be handled as a consequence of the increase in messages which has occurred.

II. INVENTORY AND APPRAISAL OF TELEPHONE COMPANY'S PROPERTY.

In March, 1908, following the delivery of our 1908 report, we were directed by your Honorable Commission to proceed with an inventory and appraisal of the property of the New England Tele-

phone & Telegraph Company. The results of this extensive undertaking were reported to you under date of March 27, 1909. We were directed by the Commission to make a complete inventory and appraisal of the company's property in Massachusetts, and to make such a valuation of the company's property in other states as would make it practicable to proportion the total value as inside of Massachusetts and outside of Massachusetts. After the work of inventorying was in progress in Massachusetts, the company undertook to make an equally detailed inventory in the other states, and after checking this inventory we utilized the data thereof for estimating the value of the properties outside of Massachusetts.

The extent of the company's physical property then in the Commonwealth of Massachusetts compared with the extent of its property now in the Commonwealth is shown in Table No. 2 appended to this report. The growth of the property in length of aerial conductors, underground conduits and underground and submarine conductors has increased more rapidly in proportion than the number of telephones, which is partially accounted for by the rapid diminution of four, six and eight-party lines in the Boston and Suburban District, and of six, eight and ten party lines in the rest of the state, which has resulted from the readjustments of the rates. Table No. 3 of this report shows the numbers of subscribers to three, four and six-party lines, exclusive of coin boxes, in the Boston and Suburban District in November, 1907, and the corresponding numbers on September 24, 1910, and April 30, 1913. This table shows that the three-party service, which was a measured rate all-round suburban service, had 1,451 subscribers in November, 1907; that this number had fallen to 682 on September 24, 1910, and that the service had entirely disappeared before April, 1913. This class of service had not been open to new subscribers for some years previous to 1907. The table also shows, as does Chart No. 6, that the number of subscribers to four-party line service, which is residence unlimited all-round suburban service, increased from a little more than 13,000 in 1907 to more than 25,000 in the fall of 1910 and has now fallen to less than 10,000. The table also shows that the six-party line service has lost in numbers of subscribers from 7,152 in 1907 to 2,866 in April of 1913.

As a consequence of the changes in plant required to meet the conditions of improved service and increasing growth of telephones accompanying the revised rates, the telephone company has expended many million dollars in permanently improving and extending its plant since the appraisal was made.

III. REVISED RATES FOR BOSTON AND SUBURBAN DISTRICT.

In accordance with your instructions transmitted to us at the opening of 1909, we studied the then existing rates in the Boston and Suburban District, and under date of February 14, 1910, presented to you an extended statistical report thereon with plans for changes of rates. After public hearings your Honorable Commission recommended a set of new rates for the Boston and Suburban District (now called the Metropolitan District) by a communication dated August 23, 1910, addressed to the President and Board of Directors of the New England Telephone & Telegraph Company. The communication was accompanied by full tables of the charges in the several classes of service. These rates were put into effect by the company following your recommendations.

The modified rates were designed to establish a system of telephone rates that are reasonable, are equitably laid on the different classes of service, and at the same time bring to the operating company a revenue which will enable it to adequately carry on its legitimate business. For this purpose it was necessary to divide the Boston and Suburban District into zones; and this made it practicable to provide that measured rate subscribers need not pay more than five cents per local message with a provision of minimum annual payments, and messages in excess of the minimum guaranteed number would be paid for at a lower rate, which was set for the time being at 3 cents each. This latter figure is still open to readjustment, and should receive further attention after the company has completed the plant changes and extensions imposed on it by the new rates. With each zone made small enough in such a rate system, the disparity of use existing between the various flat rate users getting unlimited service within their zones may be relatively small and unlimited service rates may then be offered for local residence service (and even for business service) although these rates should be different in zones of different sizes and character, being adjusted with due regard to getting a fair return to the company out of the rates and doing this without either discouraging small users or giving the service to large users at a price so low as to cause unfair discrimination.

Observations of the traffic over 1-B (one-party business unlimited zone) lines on the Fort Hill central office during 1912 showed that the number of calls originated per line varied from a maximum of approximately 23,250 per annum to a minimum of approximately 150 per annum. These records also showed that approximately

21¼ per cent. of the 1-B subscribers originate 18,000 or more calls per annum and that approximately 11½ per cent. of the subscribers to this class of service originate 10,000 or more calls per annum. Corresponding observations taken on the A service (one-party business unlimited service over the entire Metropolitan District) before the abolition of that service and the introduction of the new rates, showed that the maximum calling rate was more than 50,000 calls per annum, that approximately 5 per cent. of the A subscribers originated 18,000 or more calls per annum, and that approximately 25 per cent. of the subscribers originated 10,000 or more calls per annum. The average annual calling rate per station for all 1-B subscribers in the Central District is approximately 5,650 as compared with 7,950 for the old class A subscribers in the Central District. The foregoing figures indicate clearly that the new system of restricted zones for unlimited business service has resulted in a reduction of abuse of the service by very large users, and has diminished the disparity in the amount of service received by different subscribers to the same class of service. The reduction of the excessive use of the lines has also undoubtedly resulted in an improvement in the quality of the service.

The plan as worked out divides the Boston and Suburban District into zones as follows:—

(a) The seven Central exchanges,—Main, Fort Hill, Oxford, Tremont, Back Bay, Haymarket and Richmond, comprising one zone.

(b) Each central office in the Suburban District comprising the center of a zone which consists of the exchange district locally served by that central office plus exchange districts in the suburban territory contiguous thereto.

This provides a number of suburban zones equal to the number of the then existing suburban central offices, and the neighboring zones are caused to overlap each other so that neighboring suburban subscribers can always communicate with each other without paying a toll charge.

The local zone rates are classed in five grades fixed by the extent of the zone service. One grade includes the Central zone of seven exchanges. Another, called Grade H, includes suburban zones which in January, 1910, had more than 10,000 main stations. Another, called Grade G, includes suburban zones then with between 5,000 and 10,000 main stations. Another, called Grade F, includes suburban zones then with between 2,500 and 5,000 main stations. The fifth, called Grade E, includes exchanges then with less than

2,500 main stations. For the Grade H zones the maximum number of main stations now in any zone (as of April 30, 1913) is 31,009 and the minimum number in any zone is 14,354; for Grade G zones the maximum is 13,253 and the minimum 6,358; for Grade F zones the maximum is 7,083 and the minimum 3,737; and for Grade E zones the maximum is 2,855 and the minimum 1,096. Tables Nos. 4, 5, 6 and 7 show the number of main stations in each zone of Grades H, G, F and E, respectively, as of April 30, 1913, compared with the number of main stations in the zone as of January 29, 1910, and the percentage increase in the number of main stations in the interval.

The toll charges between zones were made so that they would fit satisfactorily with requirements of toll service to points throughout the state.

The plan also proposed abolishing the multi-party lines with the exception of four-party coin-box telephones, for the purpose of improving the general character of the service regarding which there had been a good deal of protest on account of its being unsatisfactory.

The results accomplished by the rates are indicated by the growth in numbers of telephones referred to at the opening of this report.

These rates also included extending the five cent toll radius around Central Boston to eight miles. This is sixty per cent. farther than the five miles fixed as a preliminary adjustment in 1908. All five cent message charges for messages from measured rate telephones were included in the yearly minimum guarantee of measured rate messages. At the same time the measured rate service covering the entire Metropolitan District was maintained and the ten cent tolls crossing the outer border of the Suburban District were reduced to 5 cents for distances not exceeding five miles.

The system of rates introduced was recommended as being flexible and subject to modification without the disturbances due to the old form of rates, and also as characteristically planned to encourage measured rates and to eliminate the burden of unnecessary charges on the smaller users. These rates abolished the class of business service good for unlimited use over the entire territory and introduced in the place thereof unlimited service in zones comprising the Central District of seven central offices and each Suburban exchange with its contiguous suburban central offices within the District. The measured rate telephones were fixed to receive service within a radius of eight miles for 5 cents per message up to the guaranteed minimum yearly sum, and 3 cents per message for additional mes-

sages, with an additional charge for messages extending beyond eight miles.

The original rates contemplated abolishing the so-called S and T service, namely, unlimited service within the suburban part of the district for residences on six-party and four-party lines, but the period during which old subscribers to those classes may retain the service has been extended from time to time. The number of subscribers in these classes is falling off and there are now 12,668 subscribers in the multi-party (six-party and four-party) unlimited service as compared with 20,335 subscribers when this investigation began and as compared with 30,271 subscribers at the time the new rates were put into effect. Chart No. 6, which is referred to later, shows the changes of the S and T service. This chart shows that the number of subscribers receiving service from the S lines with six-party unlimited total suburban service has been decreasing year by year throughout the period covered by the chart. This service has not been offered to new subscribers for a number of years, but old subscribers have been allowed to continue the service; the result has been a gradual decrease in the number of subscribers receiving this class of service. It will be observed that in the latter part of 1910, the time at which the new rates were offered to the public, the rate of decrease in the number of S subscribers became somewhat more rapid for a period. This seems to indicate that a portion of the S subscribers preferred to change to some one of the new classes of service. This chart also shows that the number of subscribers to T service (four-party unlimited total suburban service) increased rapidly and steadily from 1905 until September, 1910, when it exceeded 25,000. At this time the new rates were offered and since then no new subscribers to the T service have been accepted. The chart shows that the number of subscribers to the T service has decreased rapidly since September, 1910, until the number in service at the end of April, 1913, was less than 10,000, or less than 40 per cent. of the number in service at the time the new rates were put into effect. This rapid decrease indicates clearly that the new rates have proved a benefit to large numbers of people formerly having the old T service.

With the new rates, with an exception of four-party coin-box telephones, the maximum number of parties on a line within the Metropolitan District was planned to be two, and these were to be afforded divided ringing, so that neither subscribers should be annoyed by the signals made for calling the other subscriber, all of which has been accomplished for the service except for the 12,668 S and T subscribers still remaining.

Shortly after the promulgation of the new rates, one-party and two-party line, full suburban unlimited residence service was added at the price of \$45 per year for the one-party and \$36 per year for the two-party. This service corresponded in scope to the J and K service previously in force at \$54 and \$42, respectively, per year. The favorite residence classes of service are charted together on Chart No. 6 appended to this report, which shows the growth in each class. The chart shows that from December, 1904, until December, 1909, there was a slow but steady annual increase in the number of subscribers to the J and K service. Between December, 1909, and December, 1910, however, the number of subscribers in each of these classes of service decreased. This is probably due to the fact that a portion of the subscribers in these classes of service changed over to some one of the new rates offered in the fall of 1910. The original plan with the new rates was to discontinue all of the total suburban residence service (J, K, T and S) and for a time after the new rates went into effect no new subscribers for all-round suburban service were accepted. Early in 1911, however, your Honorable Commission decided to continue the one-party and two-party total suburban residence service at \$45 and \$36, respectively. These services correspond to the J and K services under the old system of rates, but the new prices are lower than the old. The effect of the introduction of these lower rates is clearly shown by the chart. The one-party full suburban service, marked 1-Sub. on the chart, which corresponds with the old J service, shows a substantial increase in the number of subscribers, and the two-party full suburban service, marked 2-Sub. on the chart, which corresponds with the old K service, shows a marked increase in the number of subscribers. The number of subscribers to the K service in December, 1910, was a little more than 1,000, whereas the number of subscribers to the two-party full suburban residence service at the end of November, 1912, was more than 6,000.

The new rates required much additional plant construction to be installed by the telephone company, on account of the fact that it was necessary to supply additional lines and switchboards for the purpose of changing the multi-party lines to two-party lines and single-party lines as the old subscribers changed their service; and the new rates also stimulated an extra rate of growth in the number of subscribers and thereby created a need for additional plant.

Table No. 8 appended hereto gives a comparison of the numbers of main stations in each of the central office divisions of the Metropolitan District (formerly called the Boston and Suburban District) as of January 29, 1910, and as of April 30, 1913. The estimated

population in each of the Central office divisions for each of the dates is also given in this table, and the telephone development of the territory measured by the number of main stations per hundred inhabitants is set down. The total telephone development, *i.e.*, the number of main stations per hundred inhabitants, was 6.4 per cent. at the opening of 1910, and on April 30, 1913, it had been changed to 8.1 per cent. Counting total telephones instead of main stations (in which total telephones include private branch terminal telephones and extension telephones) the figures are respectively 9.0 telephones per hundred inhabitants in the Boston and Suburban District at the opening of 1910, and 11.3 telephones per hundred inhabitants in the same territory at the end of April, 1913. The table shows that the main stations per hundred inhabitants have grown in every one of the Central office divisions of the Boston and Suburban District. Attention is particularly called to the notable growth in Arlington, Brighton, Cohasset, Hingham, Hull, Milton, Reading and Wellesley. It will be observed that the estimated population for 1913 is less than the estimated population for 1910 in Chelsea, Cohasset, Hingham, Milton, Randolph and Wellesley. The estimates of the population in 1910 were based on the 1900 census reports and it is evident that the rate of growth in these districts was overestimated. The estimated populations for 1913 are based on the census reports of 1910. The apparent increase in development in Cohasset and Wellesley would not be so great if the estimate of the population in these two areas in 1910 had been more accurate, but even making allowance for this, the increase in development in these two areas is notable.

The average number of main stations per 100 inhabitants for all of the central office districts in Grade H in April, 1913, was 7.0 and the corresponding figures for the Central office districts in Grades G, F and E were 7.2, 5.4 and 9.1 respectively. The average number of main stations per 100 inhabitants for the Grade E central offices showed an increase of 52 per cent. over the average number of main stations per 100 inhabitants for the same central offices in January, 1910, and the increases shown by the central offices in Grades H and F were each 35 per cent. The number of main stations per 100 inhabitants for the central offices in Grade G showed a somewhat less percentage increase, probably owing to the fact that the telephone development in these central office districts was relatively high in 1910.

Tables Nos. 4, 5, 6 and 7 give comparisons of the numbers of main stations in the exchange zones of Grades H, G, F and E, re-

spectively, for January, 1910, and April, 1913, and show also the percentage increase in the number of main stations in each exchange zone during that period. These tables show clearly the remarkable growth in the number of main stations since the introduction of the revised rates. The Newton West zone in Grade G and the Needham zone in Grade F show the minimum increase during the period, namely, 33 per cent. and the maximum increase is shown by the Weymouth zone in Grade F with an increase of 67 per cent.

The remarkable growth in the telephone development shows that the new rates have served an important want in the community. The relation of the rate of growth before and after the change in the rates is shown on Chart No. 1 appended to this report, which gives the total number of telephone stations in the Boston and Suburban District beginning with December, 1904, and coming to the end of May, 1913. This chart shows the total number of telephones in the entire Metropolitan District by curves, and also curves are given showing the number of telephones separately for the Central District and the Suburban territory. It will be observed that the curves make a deflection upwards beginning about 1910, thus showing the greater rate of growth of telephones in the territory after the new rates were put in effect. The data for this chart for the period from December, 1904, to December, 1912, are given in Table No. 9, in which is also given the increase in the number of telephones for each year. The annual accession of telephones is shown by this table to have largely increased since the establishment of the new rates.

One object of the new rates was to prevent large unlimited service users from obtaining their service below cost and to relieve the smaller users from the undue price thereby imposed upon them. Under the old rates a considerable number of subscribers to unlimited service were obtaining their messages throughout the Boston and Suburban District for less than 2 cents apiece and some were obtaining their messages for less than one cent apiece, which is manifestly below the cost to the company, and the deficit was being made up by the smaller measured rate subscribers.

Chart No. 2 appended hereto shows the price per message under the old rates paid for Boston and Suburban service by the users in the important classes of service other than private branch exchange and pay station service, the prices being estimated from the traffic counts of 1909 and the company's monthly peg counts. It will be observed from this chart that the average price paid per message from Class A telephones in Central Boston, for unlimited service

over the entire 436 square miles of the Boston and Suburban District comprising the City of Boston and forty cities and towns surrounding it, averaged only about 2 cents per message. Many subscribers in this class received their service for less than one cent per message. The chart also shows that the subscribers in a large number of the classes of service paid over 6 cents per message and those in five classes of service paid over 7 cents per message.

Chart No. 3 is a chart giving the average prices paid per message under the new rates in the Boston and Suburban District, the data being obtained from the traffic count of 1912 hereinafter described. This chart includes all messages whether terminating within or without the zone of the originating subscribers' telephones, and therefore shows the total average price paid for the messages in each class. The chart covers all of the classes of subscribers' service other than private branch exchanges and pay station service with the exception of one class which contains seven subscribers, and which therefore has too few subscribers to give a reasonable average. This is the two-party residence class in the Central zone, and the class apparently might be abolished without hardship. The two-party measured rate service would apparently give a lower price to these subscribers and they ought to be transferred thereto in case they are willing.

Of the various classes of service shown on Chart No. 3, it will be observed that the subscribers in eight of them receive their service for an average of between two and three cents a message; one between three and four cents a message; eight of them between four and five cents a message; one at substantially five cents a message; and eight at more than five cents a message. The last eight classes included 18,652 telephones at the end of 1912. These contrast with eighteen classes including 34,271 telephones which were paying more than five cents a message at the end of 1909 as shown by Chart No. 2. These charts clearly indicate the improvement in the condition of the smaller users in respect to the price per message.

The four-party business coin-box service in the Central District shows an abnormally high price per message, namely, over 8.5 cents, and these subscribers are not nearly approaching the guaranteed use which would enable them to get local messages at 5 cents apiece. We have not had an opportunity to investigate the reason for the relatively low calling rate and consequent high price per message for these subscribers, but it is the service with the lowest guaranteed price per annum for business telephone service in the Central District, and it may be that such telephones are put in by some of

the subscribers for the purpose of emergency insurance in places where the daily message service is very small. Of the former four-party coin-box users in the Central District, it may be presumed that many have now taken the two-party line measured rate service.

As already said, these charts do not include private branch exchange service, nor pay station service and one-party coin-box service which corresponds thereto.

The growth of the various classes of service, which indicates the relative popularity of the classes, is shown by Charts Nos. 4 to 7, inclusive. Chart No. 4 is for the unlimited zone services. This shows that there is a good demand for one-party business unlimited zone service and for two-party residence unlimited zone service, but there is practically no demand for two-party business unlimited zone service and only comparatively little demand for one-party residence unlimited zone service. Chart No. 5 is for the measured zone services and four-party coin-box services. This chart shows that all of these services have enjoyed good growth but that the two-party residence measured zone service has proved particularly attractive to subscribers. The chart also shows that the demand for one-party residence measured zone service is comparatively small as compared with the demand for two-party residence measured service, and that the demand for one-party business measured zone service greatly exceeds the demand for two-party business measured zone service. Chart No. 6 is for the one-party and two-party residence all-round suburban services and the S and T, six-party and four-party, residence all-round suburban services. This chart shows that the one-party and two-party residence all-round suburban services (marked 1-Sub. and 2-Sub. on the chart) have both shown an increase since the introduction of the revised rates for the services early in 1911, but that here again the two-party service has been in much greater demand than the one-party service. The S or six-party residence all-round suburban service has shown a comparatively steady falling off in numbers during the period covered by the chart, except that the decrease became a little more rapid in the latter part of 1910 when the revised rates were offered to subscribers. This service has not been open to new subscribers during the period covered by the chart. The chart also shows that the T or four-party residence all-round suburban service had a rapid increase up until the time of the introduction of the new rates (since which time the service has not been available to new subscribers) and that since that time the decrease in the number of subscribers has been rapid. A line representing the growth of the 2 MR, two-party residence measured

zone service, is dotted on the chart for purposes of comparison. It will be observed that the rate of growth of this two-party measured zone service has greatly exceeded the rate of growth of the four-party unlimited all-round suburban service, having attained a total of approximately 25,000 subscribers in about one-half the time taken by the T service to reach that number of subscribers. Chart No. 7 is for the private branch exchange service, which is a measured service, and the measured rate MZB and MZR (one-party) services at one rate over the entire Metropolitan District. The chart shows that the private branch exchange service has proved popular and that the rate of increase has been somewhat more rapid since the introduction of the revised rate schedule during the latter part of 1910. The curve representing the all-Metropolitan measured service shows that the number of subscribers to this service is decreasing in spite of the fact that the service is still offered to subscribers. There was a small increase in the number about the middle of 1911, but the gradual decrease since that time seems to indicate clearly that the subscribers are finding it advantageous to change over to some one of the new rates offered for zone or district service.

In connection with our study of rates for the Boston and Suburban District, we gathered numerous data of the telephone rates in many American cities and also of the British and continental European telephone rates. These showed that the new Boston rates were low compared with those of most of the American cities, and that European rates are not comparable on account of the great disparity of wages. We also placed in your hands memoranda showing the way in which we estimated the scales for the new rates in the effort to obtain the lowest practicable prices for the small users and yet include the necessary operating expenses of the company and interest and depreciation on its property.

Following the introduction of the new rates in the Boston and Suburban District, we kept at your request a close statistical record for many months, and during this period found that the average prices per telephone paid by the subscribers during the years succeeding the introduction of the new rates fell off compared with the prices per telephone in the years previous to the introduction of the new rates, and that this falling off for the twelve months was characteristic of all of the central office units within the District. Our original estimates indicated that the reduction in the gross revenue of the company for the number of telephones in service in 1910 which would be caused by the new rates would be approximately

\$300,000 for twelve months, when the new rates were fully in effect. This has been substantially supported by the statistics which we now have. For instance, the average price paid per telephone in the Suburban District was over \$3.50 less per telephone for the year 1911, and also for the year 1912, as compared with the year 1910. The average numbers of telephones in the Suburban District in 1910 and 1912 were, respectively, 69,113 and 88,295. Similarly, the average price paid per telephone in the Central District (in which there were 51,119 telephones in 1910 and 59,658 telephones in 1912) decreased \$1.30 in 1912 as compared with 1910. The 1911 statistics for the Central District are not indicative on account of the fact that the changes of the Boston and Suburban unlimited, or A, service had not been completed.

The rates have fulfilled the anticipation, when opportunity has arisen, of being flexible and capable of modification without disturbing their general plan. Several such modifications have been made. Thus, on January 1, 1912, the previously referred to modification which extended the benefit of the three-cent price of excess messages for measured rate telephones up to the full eight mile radius was put into effect.

IV. TRAFFIC COUNT OF 1912.

In order to determine whether further improvements could be made in the rates, it became necessary to make a careful traffic count similar to the traffic count which the company had previously made at their own instance in 1908 and 1909, but of the detail and summary results of which we had been given possession. A new traffic count was therefore begun by the telephone company in December, 1911, at the request of your Honorable Commission and with our supervision as your representatives. The primary purpose of the record was to obtain for each class of service in each of the central offices in the Metropolitan District the average annual calling rate in messages per telephone and the destination among the central offices of the messages which terminate within the limits of the district. In this instance the seven central offices in the Central District are treated as a single unit. This traffic count continued through the greater part of 1912. Three complete rounds of observations were made in each exchange with intervals of about three months between, the traffic being counted from midnight to midnight on normal days and also on Saturdays, Sundays and holidays, the number of records made and the dates of the observations depending upon the local conditions in each central office.

In making these records care was exercised to include at least one central office from each grade in each month's observations. Well distributed records were also taken of the traffic on Saturdays and Sundays and on each holiday during the period in which the special traffic record was in progress in order to determine the relation between the traffic on these days and on normal days in central offices of each grade. Sufficient data were obtained during these observations to show the distribution of messages and the average toll calling rate for each class of service. Care was taken so that the records were not made when unusual conditions or known disturbing factors existed. That is, every effort was made to get records of the normal use of the telephones. The organization of the telephone company for carrying on such special investigations in respect to the service is admirable and the effort to make the tests complete worked out smoothly.

All of the traffic originating and terminating within the Metropolitan District may be classed as follows: (1) flat rate and coin-box messages, of which no continuous record is ordinarily kept; (2) measured rate messages upon which the regular record of messages within the eight mile radius is only of numbers of messages and does not note the exchange to which the messages go; (3) local toll messages, that is, messages going beyond the eight mile radius for measured service and the zone for unlimited zone service, which are recorded in considerable detail; and (4) pay station messages, which are mostly recorded in considerable detail. In making the special record, the regular ticket or meter records, or any part of them which were available, were utilized as far as they would go and special tickets were used for the counts made by the special observers to complete the information.

The general plan and the methods employed in obtaining this special traffic record of 1912 were superior to the methods employed in the previous special records made by the company, and the data obtained may, therefore, be considered more accurate than any of the data previously used in the estimates which we have made. It must be remembered that in any such records the annual traffic per station can be obtained only by applying ratios to the averages of the various days in which the counts were made, but careful ratios were worked out in this case by the study of the normal days compared with the Saturdays, Sundays and holidays, and a study of the seasonal variation of calling was accomplished by means of the measured service, pay station and prepayment station service records of previous dates.

In this sort of work a great deal of computing must be done, and this was carried out by the telephone company from the original tickets, in most instances computing machines being used for the computations. The work has been constantly subject to our supervision and check.

We have compared our estimates of probable traffic under the new rates which were made at the time the new rates were proposed, with the records of traffic shown by the traffic count of 1912, and we find a reasonably close correspondence. Thus in the Central District the traffic for the unlimited service telephones comes out fourteen millions of messages per annum against sixteen millions by estimate, and the traffic for the district measured rate telephones comes out seventeen millions of messages per annum against seventeen and a half millions by estimate. The four-party coin-box telephones in the same district have used on the average less than two-thirds the number of messages provided within the guaranteed minimum payment, while the estimate was made on the basis of a number of messages at least equal to the number corresponding with the minimum guaranteed payment. The difference in this service comes to one and a third million messages in a total of three and two-third millions estimated. In the case of the suburban territory the four-party coin-box telephones aggregated four and a fifth millions of messages against four millions by estimate. The unlimited zone service aggregated fifteen and a half millions of messages against thirteen millions by estimate, and the district measured service in the suburbs aggregated twenty-three millions of messages against thirty millions by estimate. The difference between the estimated number of messages and the actual number for the measured service in the suburbs seems to be due to the very great popularity of the two-party residence measured rate service in which on April 30, 1913, there were 25,160 telephones, with a minimum guarantee of 480 messages for \$24 per year. There is an average use of 520 messages originated per telephone per year by these telephones. The difference is more than made up by the number of messages in the one and two-party suburban telephone service, which was introduced into the rate classification after our estimates of message rates were made and in the remaining S and T unlimited service which in our estimates were assumed to be excluded. A good part of the telephones in these classes would normally take the measured service, and would probably raise the average use of those telephones.

Just before the introduction of the new rates approximately 14.7

per cent. of the annual traffic originated from private branch exchange telephones and the remaining 85.3 per cent. originated from other telephones. At the end of 1912 approximately 20.1 per cent. of the messages originated from private branch exchange telephones and the remaining 79.9 per cent. from the other telephones. This increase of the proportion of private branch exchange traffic is doubtless partly due to the fact that the old unlimited Boston and Suburban service users (Class A users) in many instances changed to private branch exchanges under the new rates, and the rate of use per telephone in private branch exchanges was thereby slightly increased. This is a measured class of service.

Comparing the average price per message paid by the principal classes of unlimited service with the average price per message paid by the principal classes of measured service under the old rates, the unlimited services in Central Boston and the Suburbs averaged about $21\frac{1}{2}$ cents per message, and the measured services averaged about $61\frac{1}{4}$ cents per message. The new rates have distinctly reduced this diversity in the price per message, although there are still some 13,000 four and six-party unlimited service stations in the Suburban District. The present revenue from the unlimited services including local toll charges for messages to central offices within the Boston and Suburban District is about 2.8 cents per message, while the average revenue from the principal measured services is less than 4.9 cents per message.

The traffic count shows plainly the appropriateness of the graduated charges for the unlimited zone service by which the annual charge for service is higher in the zones of higher grades. Thus, for instance, the one-party business telephones show a consistent increase in the traffic for the higher grades, being lowest in the E grade, higher in the F grade, higher again in the G grade, again higher in the H grade, and highest in Central. In general, similar variations are found also in the other zone telephones whether of unlimited service within the zone or of measured rate services; but this characteristic variation is not found in the case of the telephones which have access at a single rate over the entire territory, such as the measured rate MZ telephones. Nor is it characteristically shown by the all-round suburban unlimited service, such as the four-party T service or the six-party S service, namely, unlimited residence service which is good over the entire Suburban area, which show no such direct variation of traffic with the location of the originating telephones.

It appears from the data that any further adjustments in the

way of reductions of rates, if the revenue of the company comes to the point where, in the view of the Commission, reductions can be made, should primarily be made in the direction of reducing the prices where large numbers of excess messages are utilized in connection with measured rate service, and in the direction of increasing the radius for which 5 cents will carry a message over the highly used interconnecting trunk circuits which run radially into and out of Boston to connect the Suburban central offices with the Central District.

In connection with this traffic count we have endeavored to secure data to determine the annual number of messages transmitted on the average over the interconnecting trunk circuits between central offices in the Boston and Suburban area, and the average distances over which communications are carried on through those trunk circuits. These data should be of service in ascertaining whether or not the present 5 cent radius is as large as it may appropriately be made; but we have not yet received from the telephone company the statistics necessary for the purpose.

V. SHORT DISTANCE TOLL RATES THROUGHOUT THE COMMONWEALTH.

In addition to the Boston and Suburban rates, a modification of the short distance toll rates over the whole of the State of Massachusetts was put into effect by the company in January, 1911, with the approval of the Commission, so that charges for five-minute toll messages between central offices within a distance of five miles from each other should not be greater than five cents. At the time this reduction was put into effect it affected over 390 exchanges and call offices from which calls to adjoining places less than five miles away had theretofore been charged for at the rate of 10 cents per message. A general introduction of two-number rates also went into effect for the toll territory in the State of Massachusetts. Changes have also been made in the night rate privileges.

VI. EXCHANGE RATES THROUGHOUT THE COMMONWEALTH.

During the course of 1911 the telephone company with the approval of the Commission put improved exchange rates into effect throughout the state. These rates had in view the reduction of the number of multi-party lines carrying large numbers of parties per line, and the simplification of the service, in addition to reducing the prices paid by subscribers. The exchanges in the various cities

were grouped for the purpose of fixing the rates. In Massachusetts the exchanges included eight groups proposed by the telephone company as follows:—

Group No. 1.—Springfield and Indian Orchard, conjointly, and Worcester, making two places in Massachusetts in the group.

Group No. 2.—Fall River, Lawrence, Lowell, Lynn and New Bedford, making five Massachusetts places in the group.

Group No. 3.—Brockton, Fitchburg, Haverhill, Holyoke, Salem and Taunton, making six Massachusetts places in the group.

Group No. 4.—Pittsfield, making one Massachusetts place in the group.

Group No. 5.—Beverly, Gloucester, North Adams and Northampton, making four Massachusetts places in the group.

Group No. 6.—Chicopee, Clinton, Gardner, Leominster, Marlborough, Newburyport, South Framingham and Westfield, making eight Massachusetts places in the group.

Group No. 7.—Adams, Amesbury, Amherst, Andover, Athol, Bridgewater, Concord, Danvers, Easthampton, Franklin, Great Barrington, Greenfield, Hudson, Lee, Mansfield, Marblehead, Marthas Vineyard, Middleborough, Milford, Nantucket, Natick, North Brookfield, Orange, Palmer, Peabody, Plymouth, Rockland, Saugus, Southbridge, Spencer, Stoughton, Walpole, Ware, Webster, Westborough, Whitman and Winchendon, making thirty-seven Massachusetts places in the group.

Group No. 8.—Dalton, Falmouth, Hanover, Housatonic, Lenox, Magnolia, Manchester, Medfield, Millbury, North Easton, Provincetown, Sagamore, Sharon, Stockbridge, Turners Falls, Williamstown, Wrentham and 116 smaller exchanges, making one hundred and thirty-three Massachusetts places in the group.

The foregoing grouping was made for the purpose of introducing rates which approximate as closely as practicable the requirements of the various parts of the very diverse telephone territory in the State of Massachusetts, and the grouping was based largely upon the telephone development in the various places. The groups were ultimately extended over the whole of the company's territory, including the three states to the north as well as the State of Massachusetts. At the time the grouping was made the average number of telephones per central office or central office district in Group No. 1 was 12,532, in Group No. 2 was 5,990 per central office, in Group No. 3 was 3,299 per central office, in Group No. 4 was 4,254 per central office, in Group No. 5 was 1,821 per central office, in Group No. 6 was 1,327 per central office, in Group No. 7 was 548

per central office, and in Group No. 8 was 122 per central office. We have not followed up these statistics to see what changes have occurred in the two years during which these rates have been in effect. The rates are of notably simple character as compared with the rates which they replaced, and they contrast favorably in regard to the service given for the money charged. In all these groups unlimited business and residence service within the exchange is given, but it will be observed that the largest group averaged only 12,532 telephones per central office or central office district, and the unlimited service is consequently practicable. Business unlimited service is confined to single-party lines in the first two groups. In the other groups, two-party lines are allowed for business, and in Group No. 8, which is composed of very small central offices, four-party lines are allowed for business. In the last five groups, six-party lines are allowed for residences. These classifications are practicable in view of the different sizes of the various central offices.

These improved rates made obsolete the old six-party service of the company in the larger places outside of the Boston and Suburban District, and the old ten-party service in smaller places, which service had been notably poor, as will be almost inevitable with so many parties on city and village lines. The change was effected without injuriously affecting the subscribers' privileges, and the lowered rates gave the subscribers throughout the state a decided advantage by the new arrangement.

VII. INCREASE OF TELEPHONES IN MASSACHUSETTS.

The growth of the number of telephones in the Metropolitan District has already been described, and the data given in Chart No. 1 and Table No. 9. The growth in the State of Massachusetts outside of the Metropolitan District is shown in Table No. 10, and the growth of the total number of telephones in the state is shown in Table No. 11. These data of growth in Massachusetts are jointly for the New England Telephone & Telegraph Company and its subsidiary the Southern Massachusetts Telephone Company. The annual growth (amounting to an accession of 29,397 telephones in 1912) is sufficient to command the equivalent of the installation every year of at least two of the largest switchboards which are usually installed, but being distributed throughout the state the growth results in the gradual extension of numerous existing switchboards rather than of the construction of a few very large boards. It also results in the gradual addition to the number of central

offices, as it becomes economical and desirable to divide exchange districts on account of the increasing number of telephones therein. Thus, for instance, during the year 1912, three new central offices were added to the system, namely, Bellevue as a division from the Jamaica Plain central office, Burlington (which had previously been served from Woburn, but as a separate central office with distinct rates which did not include service in the Boston and Suburban District), and Manomet (which had previously been served from the Plymouth central office), while the City of Worcester, which had previously been served by one central office, is now being arranged to be served by two, which are called, respectively, Park and Cedar. Also, during the summer season of 1912, a central office was maintained at Woods Hole. The growth of the year 1912, which is continuing in the year 1913, is illustrative. The company is, therefore, under very heavy requirements for increasing plant. It will be observed in Table No. 2, which gives a comparison of the physical plant in Massachusetts in 1908 and 1913, that there were 247 central offices in 1908 and 256 on June 1, 1913, which figures include certain instances of two exchanges under one roof served from substantially the same switchboard. The increase shown is the net increase. A larger number of new offices were opened during the interval, but certain others were closed by consolidating neighboring offices.

As pointed out on Page 173, the main stations in the Metropolitan District increased 64.2 per cent. in five and one-third years ending last April, and the total telephones in the same District increased 67.5 per cent. during the same period. The official returns of financial results are made to your Honorable Commission by the company by years ending June 30, and the data for the year ending June 30, 1913, are not yet available; but the returns show that for the four years ending June 30, 1912, the company's revenue from Massachusetts increased 37.8 per cent. and its Massachusetts operating expenses and taxes increased 40.2 per cent. During the same period the number of telephones increased just over fifty per cent. We do not have the figures for plant investment in Massachusetts separately in 1912, and therefore cannot make a direct comparison of the increase of the investment without additional investigation, but the length of conductors, length of conduits, and certain other expensive parts of plant have increased in greater ratio than the number of telephones, but the number of central office switchboards has not increased so rapidly.

VIII. OUR WORK IN HAND DURING 1913.

During the early part of this year we have had in hand on your behalf work relating to the computation of the 1912 traffic count; also certain studies of the costs of service, and questions of the five-cent radius about Boston. Of the latter two points the data requisite have not yet been completed.

We have also had under consideration a test of the accuracy of the metering and counting of the traffic on measured service lines in the Metropolitan District. We gave you under date of April 25, 1913, a preliminary memorandum in regard to the standard methods utilized by the company in counting or metering measured messages; and also describing methods of testing the accuracy of such metering which are utilized by certain large companies in checking their own service, and by public service commissions as far as we have learned that the latter have heretofore undertaken such work. The precedents for this work by public commissions are very meagre, and we outlined a plan of our own for proceeding with the test in Boston and its suburbs. The execution of the test was postponed on account of an impending strike of operators which at that time seemed imminent. Since the strike controversy between the operators and the telephone company has been settled, the transfer of the supervision of telephone rates and service from your Honorable Commission to the new Public Service Commission has been under contemplation, and therefore under your instructions we have not again taken this matter up for execution.

Respectfully submitted,

D. C. AND WM. B. JACKSON.

TABLE 1.—*Trunked Traffic Between the 16 Suburban Central Offices within the 5-mile Radius and the Central District, 1906 and 1912.*

BETWEEN CENTRAL DISTRICT OFFICES AND —	TOTAL MESSAGES IN AND OUT.	
	1906.	1912.
Charlestown,	2,028,000	3,549,000
East Boston,	1,241,000	2,041,000
South Boston,	1,620,000	2,769,000
Cambridge,	4,243,000	7,286,000
Chelsea,	991,000	1,721,000
Roxbury,	3,523,000	7,837,000
Somerville,	1,752,000	3,929,000
Brookline,	3,116,000	4,957,000
Everett,	484,000	1,278,000
Dorchester,	2,245,000	5,278,000
Revere,	270,000	1,065,000
Winthrop,	410,000	1,474,000
Jamaica Plain and Bellevue,	1,540,000	3,046,000
Brighton,	747,000	1,604,000
Malden,	888,000	1,935,000
Medford,	343,000	1,024,000
Total of above,	25,441,000	50,793,000

TABLE 2.—*Extent of Plant of New England Telephone and Telegraph Company in Massachusetts in 1908 and 1913.*

ITEM.	Inventry of 1908.	June 1, 1913.
Number of buildings owned by Company,	53	76
Parcels of land owned by Company,	54	71
Number of exchange central offices,	247	256
Number of operators' positions at exchange switchboards,	2,367	2,901
Length of pole lines (approximate), miles,	7,754	9,345
Length of underground conduits { feet, miles,	3,100,901	5,654,900
These comprise underground ducts { feet, miles,	587	1,071
Number of manholes in underground conduits,	14,370,649	20,708,100
Aggregate length of pole lines and conduits, miles,	2,721	3,922
Length of open wire on pole lines, miles,	11,217	14,114
Length of aerial cable { feet, miles,	8,341	10,416
Length of conductors in aerial cables, miles,	67,599	102,616
Total length of overhead conductors, miles,	5,264,160	10,707,800
Length of submarine cables { feet, miles,	997	2,028
Aggregate length of aerial, underground and submarine cables,	66,836	151,114
Length of underground cables { feet, miles,	134,435	253,730
Length of conductors in underground and submarine cables, miles,	6,663,360	9,947,500
Aggregate length of telephone conductors in all cables and wires,	1,262	1,884
Number of poles,	52,400	62,300
Number of subscribers' telephones,	10	12
	318,225	606,194
	2,269	3,924
	452,660	859,924
	310,138	378,017
	199,382 ²	330,173

¹ Including three buildings in process of construction.

² Number of subscribers' telephones as of Aug. 31, 1908.

TABLE 3. — *Comparison of the Number of Main Stations, excluding Coin-box Stations, served from 3, 4 and 6-party Lines in November, 1907, September, 1910, and May, 1913.*

CLASS OF SERVICE.	NUMBER OF MAIN STATIONS SERVED.		
	November, 1907.	Sept. 24, 1910.	April 30, 1913.
3-party line, ¹	1,451	682	-
4-party line,	13,183	25,326	9,802
6-party line,	7,152	4,945	2,866
Total,	21,786	30,953	12,663

¹ Measured rate all-round suburban service.TABLE 4. — *Comparison of Numbers of Main Stations in Exchange Zones for the Years 1910 and 1913 and the Percentage Increase (Grade H).*

EXCHANGE ZONE.	MAIN STATIONS.		
	Jan. 29, 1910.	April 30, 1913.	Percentage Increase.
Arlington,	12,108	18,458	52
Belmont,	10,132	14,354	42
Brighton,	14,245	20,018	41
Brookline, ¹	21,658	31,009	43
Cambridge, ¹	18,966	27,586	45
Charlestown,	12,437	18,485	49
Dorchester,	16,215	24,797	53
Everett,	10,604	16,252	53
Jamaica Plain,	21,062	30,693	46
Medford,	11,884	17,665	49
Milton,	11,889	18,616	57
Newton North,	17,177	24,129	41
Newton South,	14,236	20,473	44
Roxbury,	18,250	26,888	47
Somerville,	12,578	18,701	49
South Boston,	10,857	16,037	48

¹ Revised zone.TABLE 5. — *Comparison of Numbers of Main Stations in Exchange Zones for the Years 1910 and 1913 and the Percentage Increase (Grade G).*

EXCHANGE ZONE.	MAIN STATIONS.		
	Jan. 29, 1910.	April 30, 1913.	Percentage Increase.
Dedham,	4,982	7,517	51
Hyde Park,	5,708	8,654	52
Lexington,	5,039	7,215	43
Malden,	6,342	9,597	51
Melrose,	5,531	7,988	44
Newton West,	6,499	8,669	33
Quincy,	8,377	13,253	58
Revere,	6,920	10,768	56
Stoneham,	5,342	7,615	43
Waltham,	6,225	8,537	37
Wellesley,	4,708	6,358	35

TABLE 6. — *Comparison of Numbers of Main Stations in Exchange Zones for the Years 1910 and 1913 and the Percentage Increase (Grade F).*

EXCHANGE ZONE.	MAIN STATIONS.		
	Jan. 29, 1910.	April 30, 1913.	Percentage Increase.
Braintree,	3,629	5,988	65
Canton,	3,438	5,019	46
Chelsea,	4,433	7,083	60
East Boston,	4,451	6,997	57
Needham,	2,808	3,737	33
Randolph,	2,562	3,981	55
Wakefield,	2,614	3,775	44
Weymouth,	2,669	4,446	67
Winchester,	4,528	6,516	44
Winthrop,	2,670	4,285	61
Woburn,	2,824	3,843	36

TABLE 7. — *Comparison of Numbers of Main Stations in Exchange Zones for the Years 1910 and 1913 and the Percentage Increase (Grade E).*

EXCHANGE ZONE.	MAIN STATIONS.		
	Jan. 29, 1910.	April 30, 1913.	Percentage Increase.
Cohasset,	690	1,096	59
Hingham,	1,127	1,813	61
Hull,	690	1,096	59
Lincoln,	2,049	2,855	39
Norwood,	1,138	1,540	35
Reading,	1,858	2,673	44

TABLE 8. — *Comparison of Telephone Development in the Central Office Divisions of the Metropolitan District for 1910 and 1913.*

CENTRAL OFFICE DISTRICTS.	DATA OF JAN. 29, 1910.			DATA OF APRIL 30, 1913.		
	Main Stations Jan. 29, 1910.	Esti- mated Popu- lation.	Main Stations per 100 Inhab- itants.	Main Stations April 30, 1913.	Esti- mated Popu- lation.	Main Stations per 100 Inhab- itants.
Central,	24,530	171,000	14.3	31,439	190,000	16.5
Arlington,	984	12,300	8.0	1,576	14,100	11.2
Belmont,	424	4,620	9.2	718	6,000	12.0
Braintree,	406	7,350	5.5	611	8,500	7.2
Brighton,	1,456	23,600	6.2	2,475	26,800	9.2
Brookline,	4,651	37,800	12.3	6,477	44,500	14.5
Cambridge,	4,712	103,000	4.6	6,572	108,000	6.1
Canton,	228	4,720	4.8	303	4,900	6.2
Charlestown,	810	40,000	2.0	1,141	41,700	2.7
Chelsea,	971	37,300	2.6	1,571	36,800	4.3
Cohasset,	198	3,400	5.8	290	2,600	11.1
Dedham,	608	10,400	5.8	772	11,100	7.0
Dorchester,	4,918	84,500	5.8	7,539	92,300	8.2

TABLE 8. — *Comparison of Telephone Development in the Central Office Divisions of the Metropolitan District for 1910 and 1913 — Concluded.*

CENTRAL OFFICE DISTRICTS.	DATA OF JAN. 29, 1910.			DATA OF APRIL 30, 1913.		
	Main Stations Jan. 29, 1910.	Estimated Population.	Main Stations per 100 Inhabitants.	Main Stations April 30, 1913.	Estimated Population.	Main Stations per 100 Inhabitants.
East Boston,	1,018	54,700	1.9	1,563	61,700	2.5
Everett,	1,081	32,300	3.4	1,796	35,400	5.1
Hingham,	361	5,620	6.4	534	5,000	10.7
Hull,	131	2,360	5.6	272	2,400	11.3
Hyde Park,	809	16,600	4.9	1,129	16,900	6.7
Jamaica Plain and Bellevue,	2,742	48,400	5.7	4,374	57,600	7.6
Lexington,	523	6,050	8.6	707	6,500	10.9
Lincoln,	121	1,130	10.7	152	1,300	11.7
Malden,	2,198	41,000	5.4	3,116	47,300	6.6
Medford,	1,146	18,800	6.1	1,774	24,500	7.2
Melrose,	1,364	15,000	9.1	1,899	16,600	11.4
Milton,	1,321	22,600	5.8	2,076	22,200	9.3
Needham,	293	4,520	6.5	474	5,600	8.5
Newton North,	2,084	26,000	8.0	2,785	28,000	9.9
Newton South,	1,342	12,200	11.0	1,709	13,400	12.7
Newton West,	1,103	11,800	9.4	1,397	13,800	10.1
Norwood,	302	7,380	4.1	465	8,700	5.3
Quincy,	1,295	30,300	4.3	2,310	37,100	6.2
Randolph,	170	6,710	2.5	274	6,400	4.3
Reading,	427	5,970	7.2	677	6,100	11.1
Revere,	553	14,200	3.9	1,012	22,500	4.5
Roxbury,	4,671	102,000	4.6	6,617	127,000	5.2
Somerville,	3,845	74,400	5.2	5,842	78,200	7.5
South Boston,	1,268	71,300	1.8	1,881	74,700	2.5
Stoneham,	292	6,350	4.6	393	7,200	5.5
Wakefield,	531	10,900	4.9	806	12,100	6.7
Waltham,	1,405	29,900	4.7	1,996	30,900	6.5
Wellesley,	565	6,860	8.2	782	6,400	12.2
Weymouth,	437	11,700	3.7	717	13,300	5.4
Winchester,	674	8,870	11.0	1,269	9,900	12.8
Winthrop,	1,099	7,890	13.9	1,710	11,200	15.3
Woburn,	608	14,500	4.2	797	15,600	5.1
Total Suburban District,	56,445	1,097,000	5.1	83,350	1,222,800	6.8
Total Metropolitan District,	80,975	1,268,000	6.4	114,789	1,412,800	8.1

TABLE 9. — *Total Stations in Central, Suburban and Metropolitan Districts and Annual Increase from 1904 to 1912.*

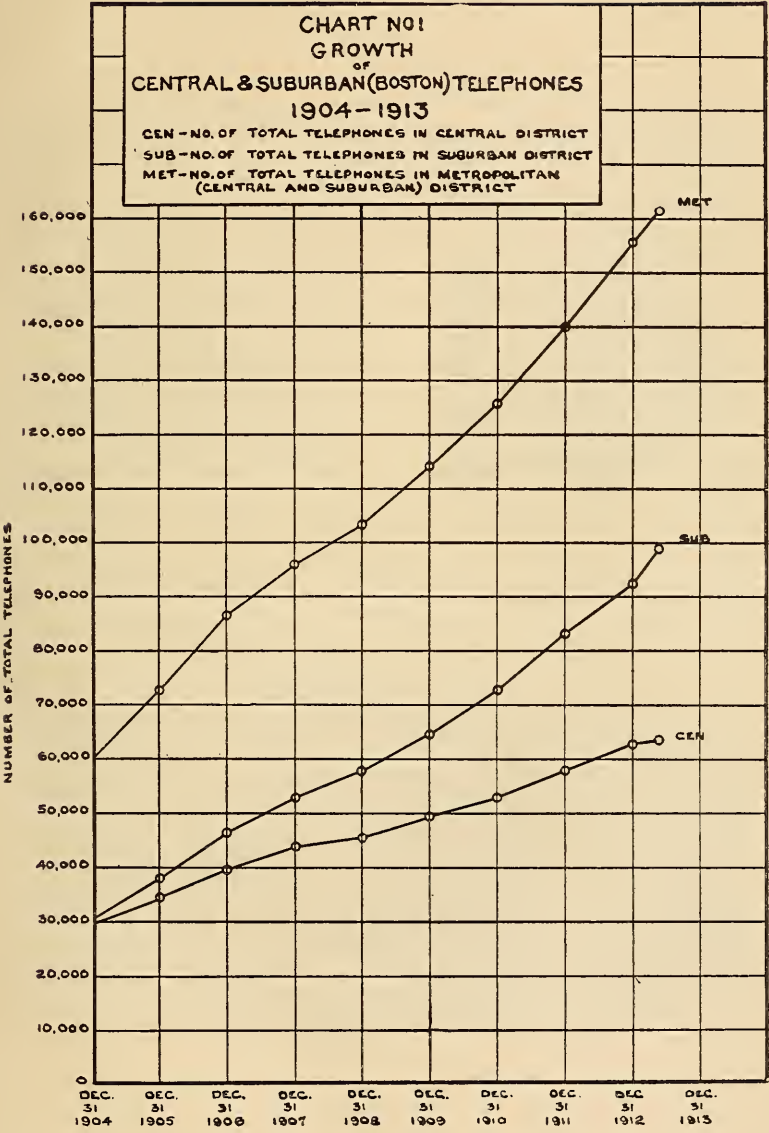
DATE.	TOTAL STATIONS.			Increase during Year in Metropolitan District.
	Central District.	Suburban District.	Metropolitan (Central and Suburban) District.	
December, 1904,	29,935	30,311	60,246	6,490
December, 1905,	34,437	37,873	72,310	12,064
December, 1906,	39,732	46,383	86,115	13,805
December, 1907,	43,405	52,446	95,851	9,736
December, 1908,	45,406	57,718	103,124	7,273
December, 1909,	49,132	64,677	113,809	10,685
December, 1910,	52,912	72,847	125,759	11,950
December, 1911,	57,133	83,020	140,153	14,394
December, 1912,	62,463	92,464	154,927	14,774

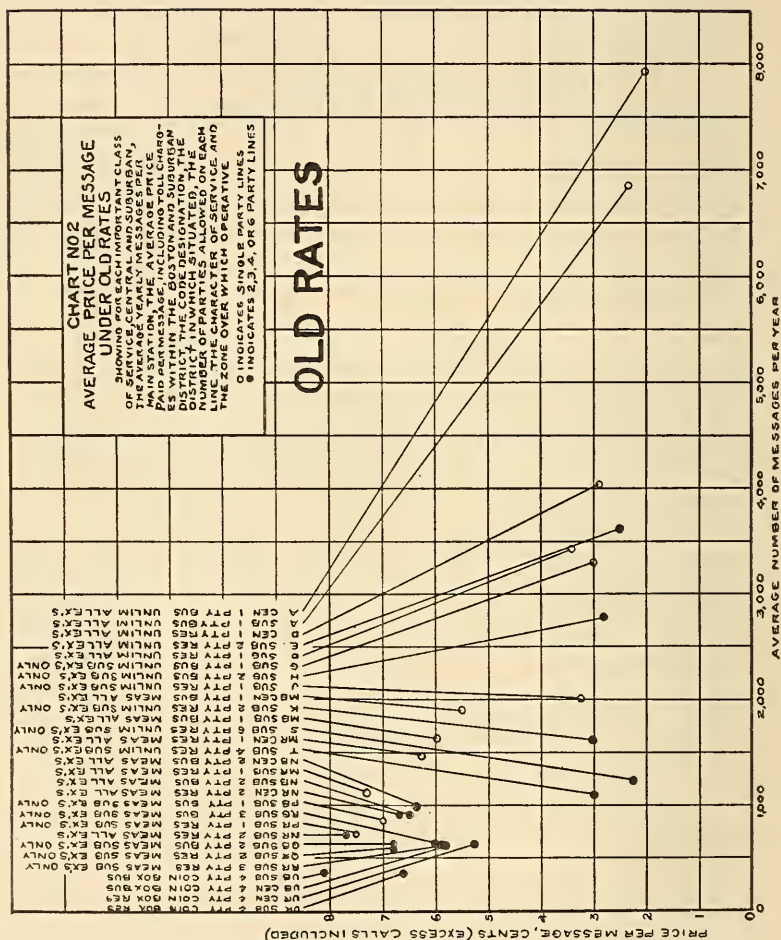
TABLE 10. — *Total Stations of the New England Telephone and Telegraph Company (and Southern Massachusetts Telephone Company) in Massachusetts Outside of the Metropolitan District, and Annual Increase from 1904 to 1912.*

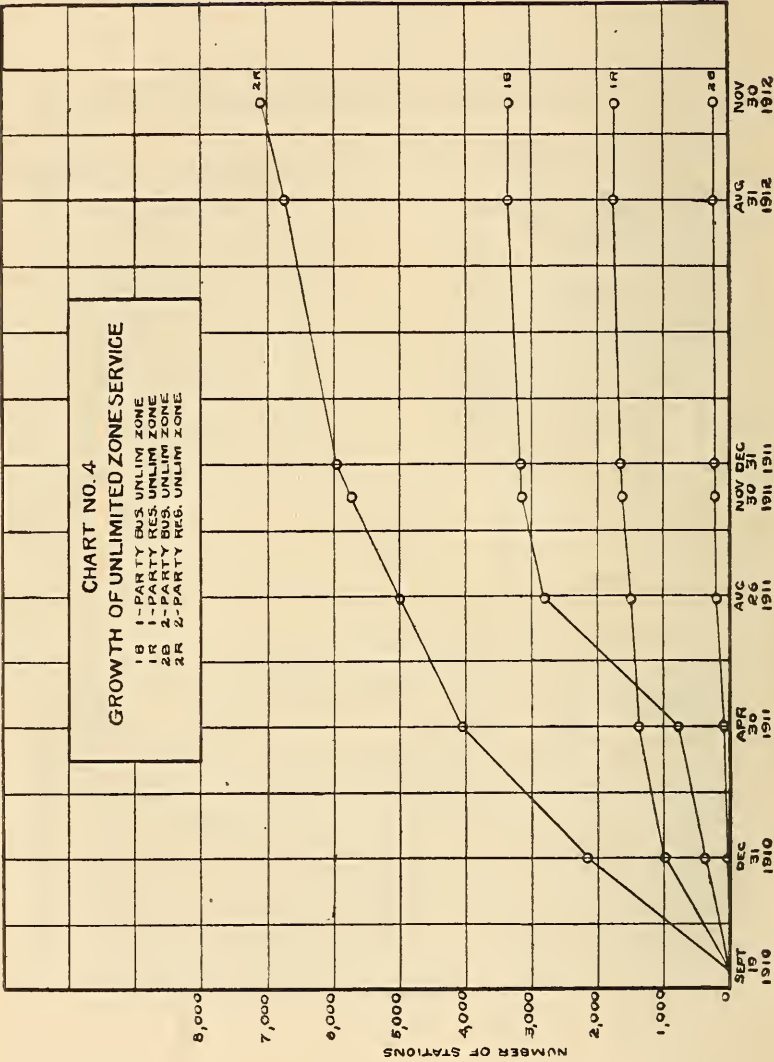
YEAR.	Total Tele- phones in Massachusetts, excluding Metropolitan District.	Increase during the Year.
December, 1904,	53,473	7,886
December, 1905,	67,030	13,557
December, 1906,	84,295	17,265
December, 1907,	98,062	13,767
December, 1908,	104,427	6,365
December, 1909,	115,991	11,564
December, 1910,	132,185	16,194
December, 1911,	147,290	15,105
December, 1912,	161,913	14,623

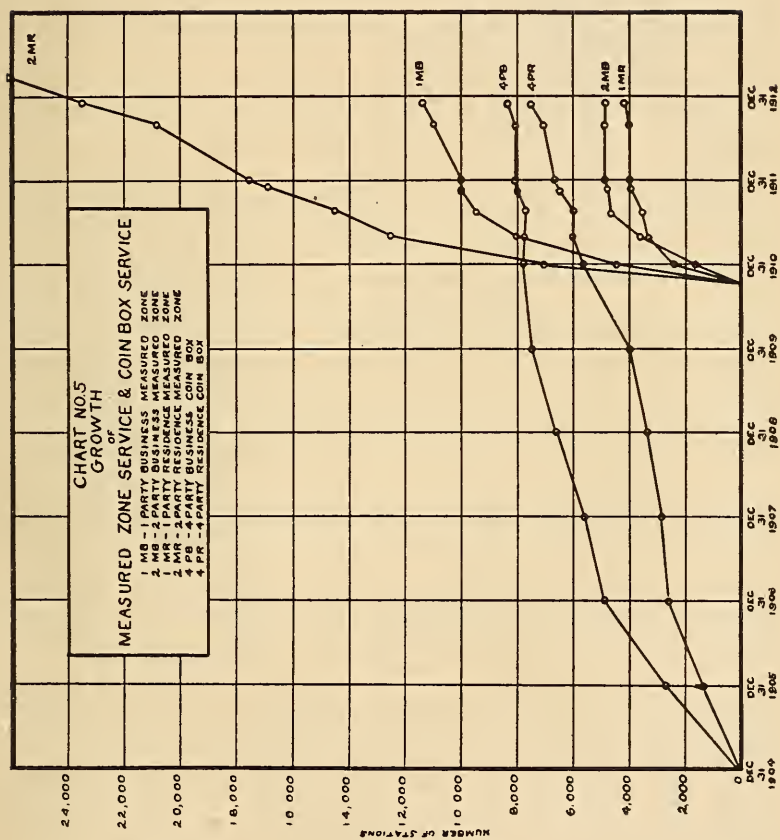
TABLE 11. — *Total Stations of the New England Telephone and Telegraph Company (and Southern Massachusetts Telephone Company) in Massachusetts, and Annual Increase from 1904 to 1912.*

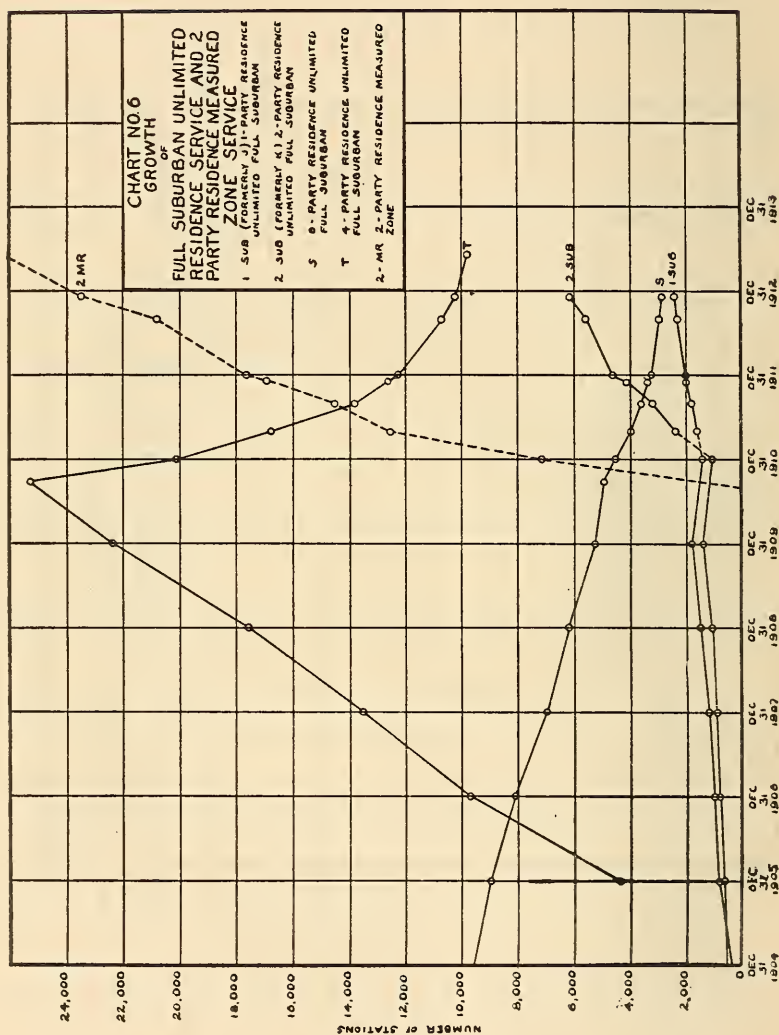
YEAR.	Total Tele- phones in Massachusetts.	Increase during the Year.
December, 1904,	113,719	14,376
December, 1905,	139,340	25,621
December, 1906,	170,410	31,070
December, 1907,	193,913	23,503
December, 1908,	207,551	13,638
December, 1909,	229,800	22,249
December, 1910,	257,944	28,144
December, 1911,	287,443	29,499
December, 1912,	316,840	29,397

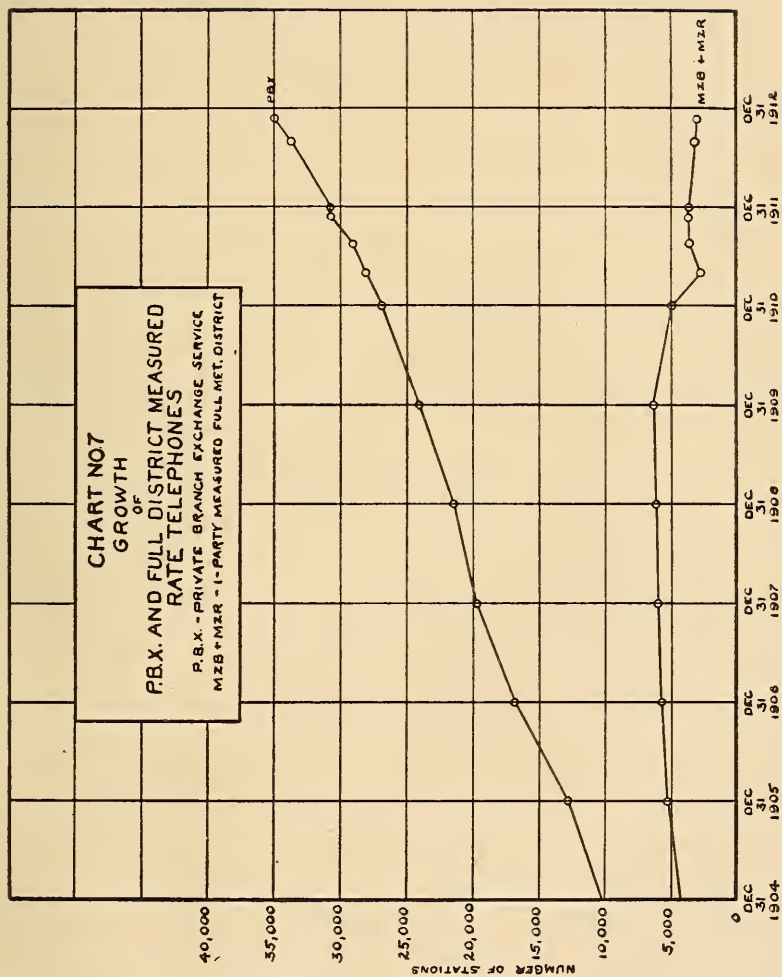












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